# PMI

VOL. 2 NO. 6
JUNE
1959
PRICE 50c

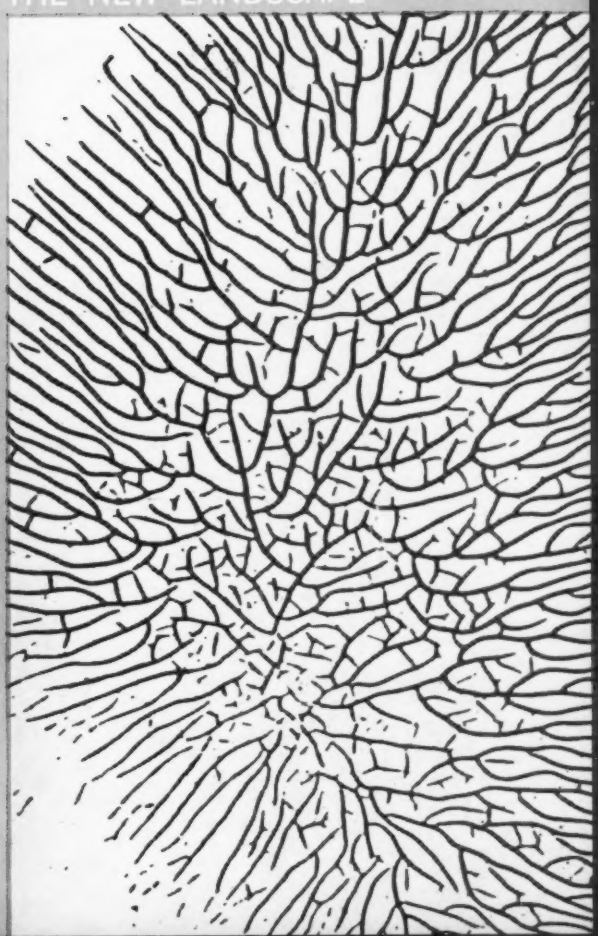
# PHOTO METHODS FOR INDUSTRY

GRAPHIC ARTS AND REPRODUCTION SECTION

STAVID'S STAFF

OUCH!

THE NEW LANDSCAPE



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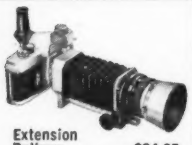
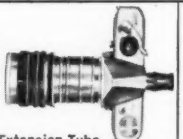

Extension Bellows .....$24.95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f:1.5 ..... 55 mm lens
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f:4 .....250 mm lens
f:5.6 .....600 mm lens
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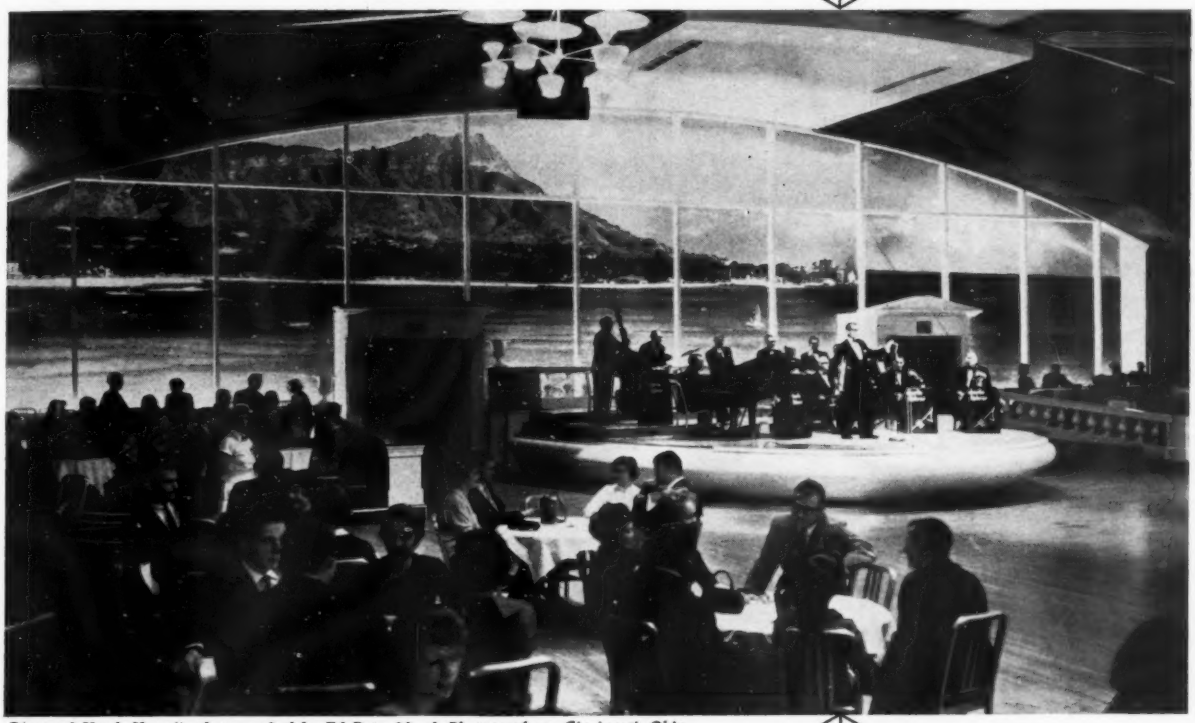
Get more information. Circle 453, page 61

# THE WORLD'S LARGEST COLOR PHOTOGRAPH!

## made by Color Corporation of America

This eighty foot color spectacular, made in twenty foot high sections, was produced from a negative measuring only 2 x 8 inches, or 825 — 1/100,000's the size of the final Ektacolor print. The picture, so big it had to be mounted in an airplane hanger, required 2,550 square feet of paper. It occupies the entire west wall of the Cincinnati Music Hall Ballroom—a realistic, breathtaking "window-on-the-world."



*Diamond Head, Hawaii, photographed by Ed Betz, Marsh Photographers, Cincinnati, Ohio*

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**Get more information. Circle 414, page 61**

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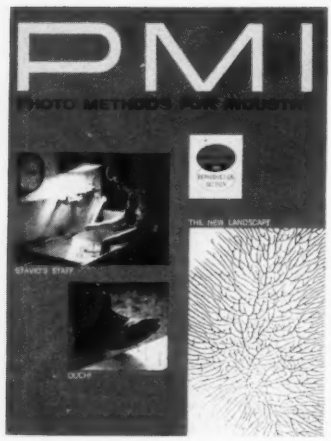
JUNE, 1959

VOL. 2 NO. 6

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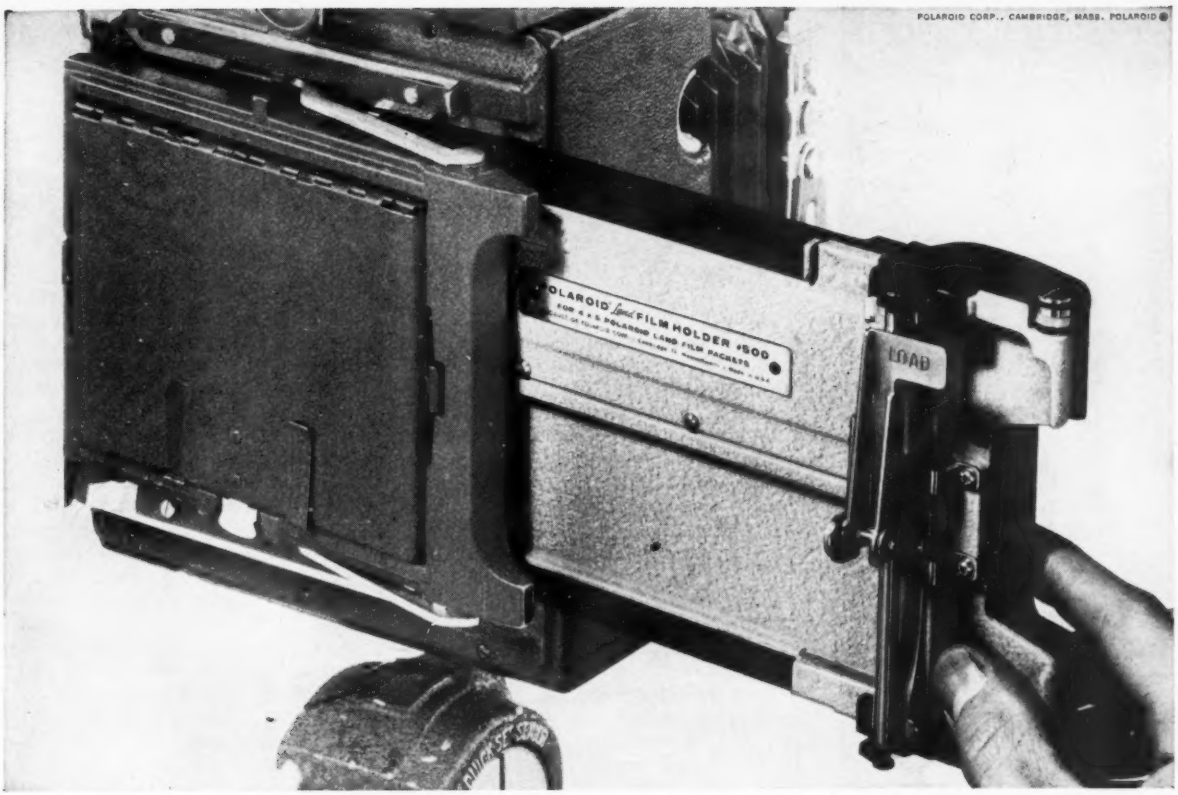
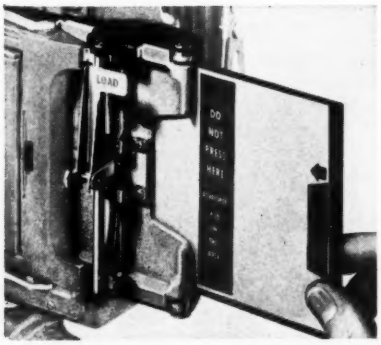



**(1)** This new Polaroid Land film holder is interchangeable with your regular film holders. Slide it in and you're ready to produce a finished full-size 4 x 5 picture of professional quality in 60 seconds. There's no change in film plane; no readjustment of rangefinder or ground glass. The holder remains in the camera as you shoot picture after picture without delay. A new specially designed 4 x 5 film packet contains negative, positive sheet and developing pod . . . all the elements necessary for a 60-second picture.

## NEW POLAROID® LAND 4X5 FILM-HOLDER

# Instantly adapts your 4 x 5 camera for 60-second pictures!




**(2)** Slip in this new Polaroid Land film packet, pull back protective envelope and take your picture. Flip down lever and pull film packet out to process picture.

**(3)** Picture processes itself inside its packet, *outside the camera.* In 1 minute, pull packet apart and see the finished picture. If desired, development can be postponed.

**(4)** The pictures are of exceptional quality, made with either of two new Polaroid Land films. The film holder costs $49.95. The packets, $6.22 and $7.31 per box of 12.

Get more information. Circle 460, page 61

FOR THOSE WHO DEMAND THE FINEST in

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and

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- Complete **BLACK & WHITE** 16 - 35 mm film processing facilities.
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JUdson 6-0367

Get more information. Circle 454, page 61

# F.Y.I.

One of the more famous slogans in photography during the '30s was used by the makers of a classic 35mm camera, claiming that if you could see it, you could photograph it (assuming, of course, that you used their camera). This bit of pre-space age trivia came to us as we read the announcement for the annual Society of Photographic Instrumentation Engineers convention and "Exhiborama" to be held in Los Angeles August 4th to 6th. This group, whose motto might well be "if you can't see it, photograph it" will discuss problems of space age technology, covering such humdrum chores as tracking mesons in the electromagnetic interaction with other fundamental particles, exploring ocean depths and all the rest.

### Built to last dept.

Long before people knew of mesons and fundamental particles, a sturdy, if not utilitarian, construction project was going up near Cairo. The existence of this project after 5,000 years confirms the claims of critics of modern construction that "they just don't build them like that any more." Well, anyway, the Sylvania people (each of whose flashbulbs can be identified by a blue dot) have decided that the biggest building in the project, the great Pyramid of Cheops, is worthy of a super-colossal epic-type photograph. Using 6,000 of those blue dot bulbs (a number equaled only by a 1954 effort showing the Pennsy's Horseshoe Curve), the immortal chunk of construction was duly recorded May 25. It was originally scheduled for May 18 but what with sandstorms and stuff, there was a delay, the details of which were not available at this time.

### Penny wise—ad foolish

False economy for industrial advertisers results in more non-productive advertising than any other factor, charged Alexander Roberts, of New York, president of Interstate Industrial Reporting Service, Inc.

A major portion of the blame for the sorry state of industrial advertising must be attributed to penny-pinching photographic budgets authorized by management, Roberts declared. On the other hand, he pointed out, consumer advertising managers know that it's worthwhile to pay up to 10 per cent of the cost of space for an illustration that "packs a punch."

Roberts cited surveys to show that 38 out of 100 people who are "stopped" by the illustration will read the entire copy in an advertisement. "Obviously," he pointed out, "the mediocre, static photo that fails to stop the reader—and get him to read the ad—nullifies all the work and expense that have been put into producing and placing the advertisement. Economizing on photography, which at its best is only a fraction of the total advertising budget, is utterly wasteful. Photography can make or break the ad."

### Living with history

Some people are fortunate in having a box seat at history. Winston Churchill is a famous example; his life began in the golden age of Queen Victoria. No less illustrious to us, if not to the world, is William Mayfield, America's first aerial photographer. A native of Dayton, Ohio, he was a news photographer on the Dayton *Daily News* when in November, 1910, he took an air view of the hangar at Simms Station. His pilot? Orville Wright. Before this assignment, Mayfield had taken a number of pictures from captive balloons. In 1912, he recorded the first fatal airplane crash and in 1925, the destruction of the Navy dirigible "Shenandoah." In 1926, he photographed the first experimental helicopter flight by the Army.

He opened his studio, Mayfield Photos, 47 years ago, and will continue as vice-president in charge of aerial photography. The bulk of commercial work, however, will be in charge of Bob Rogers, now president of the firm, who joined Mayfield in 1948. We extend our sincere congratulations to Mr. Mayfield on his semi-retirement and would not be surprised if the first photographs from a manned missile bore his credit line.—THE END

# new! Ansco Versapan SHEET FILM

*An all new medium speed emulsion of maximum resolution, minimum grain and superb tonal quality*

Here at last, after years of intensive research is Versapan® film, a totally new concept of photographic image quality.

Versapan has been specifically formulated to provide virtually grainless images even under mural size enlargements.

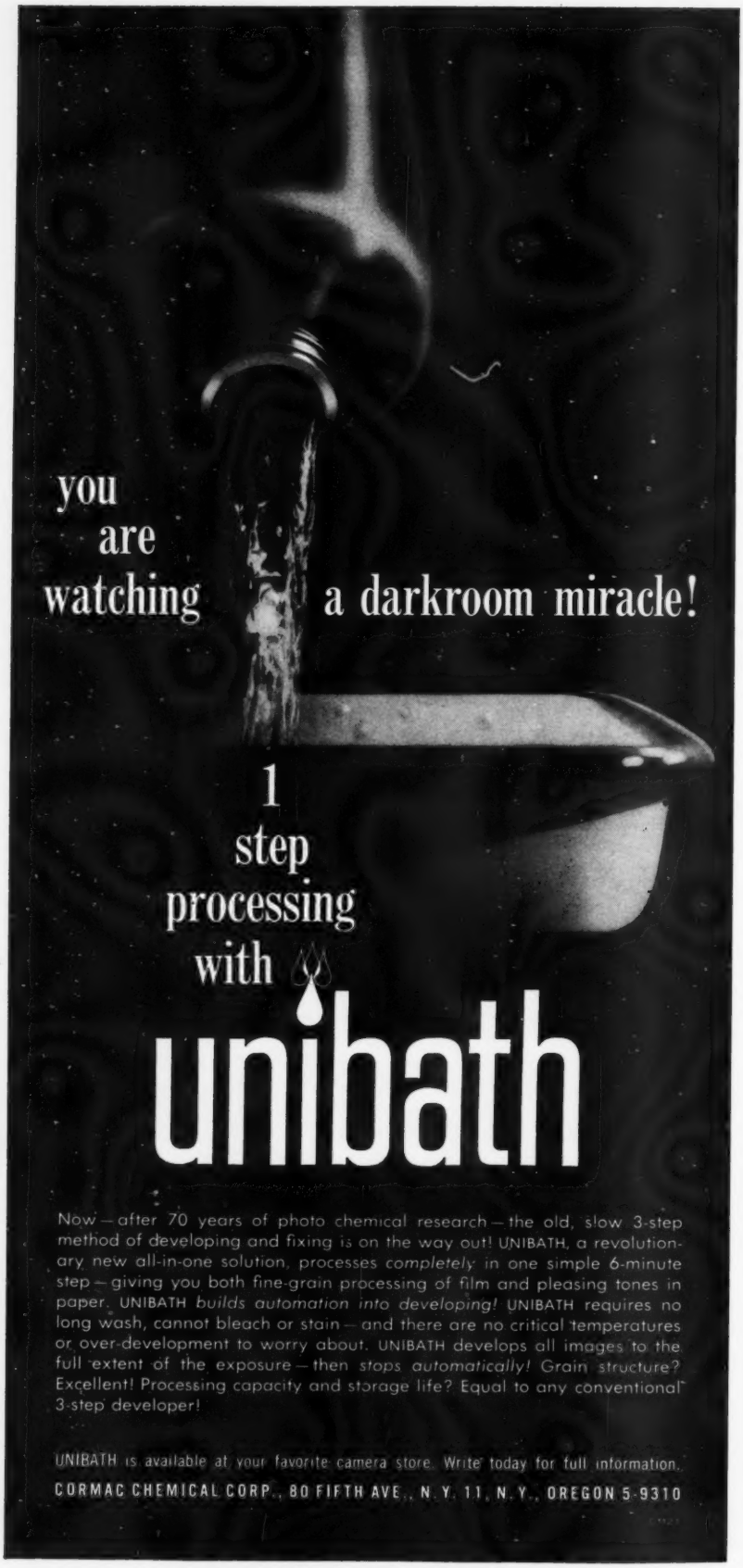
Versapan's flexibility under all conditions makes it a first choice for *one* film that must do many jobs. Sensitive to development variation, Versapan's contrast can be critically controlled for optimum quality under a wide variety of applications. In fact, so ideal is Versapan's panchromatic balance, that it is a preferred emulsion for critical portrait, commercial and industrial applications as well as color separation work! Why not try Versapan today for *your* critical assignments. Ansco, Binghamton, N. Y., A Division of General Aniline & Film Corporation.

**TECHNICAL DATA**

| EXPOSURE INDEX | DAYLIGHT 50 | TUNGSTEN 40 |
|---|---|---|
| *Developer* | *Purpose* | *Processing time* |
| Isodol | General | 4-6 minutes |
| Isodol 1:1 | Portrait | 5-7 minutes |
| Permadol | High Contrast | 4-6 minutes |
| Normadol | Portrait | 16 minutes |

Ansco
Versapan

Get more information. Circle 403, page 61


you are watching a darkroom miracle!
1 step processing with
unibath
Now—after 70 years of photo chemical research—the old, slow 3-step method of developing and fixing is on the way out! UNIBATH, a revolutionary new all-in-one solution, processes *completely* in one simple 6-minute step—giving you both fine-grain processing of film and pleasing tones in paper. UNIBATH *builds automation into developing!* UNIBATH requires no long wash, cannot bleach or stain—and there are no critical temperatures or over-development to worry about. UNIBATH develops all images to the full extent of the exposure—then *stops automatically!* Grain structure? Excellent! Processing capacity and storage life? Equal to any conventional 3-step developer!
UNIBATH is available at your favorite camera store. Write today for full information.
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Get more information. Circle 420, page 61

# LETTERS

To the Editor:
We are enclosing a copy of an ad that appeared in the February 1959 issue of your magazine. [p. 28, for the Statmaster Corp.]

The statement, "What's more, you're paying for mediocre quality, slow service, minimum, overtime and special service charges," not only implies that the Photo Copyists throughout the country are guilty of fraud and laxity, but the users of their products are lacking in good sense for putting up with them.

It seems that the sentence, "This is not good business . . . for you or your clients," certainly applies to this type of advertising.

Robert Falkenberg
President
Peerless Blue Print Co.

*PMI sent copies of Mr. Falkenberg's and other similar letters to the Statmaster Corp. The following contrition was received:*

To the Editor:

The statement used in Statmaster advertising to which Mr. Falkenberg objects was never intended to question the integrity of photo reproduction services nor the intelligence of their clients.

We do assert, however, that a Statmaster reproduction camera provides its owner with quality and speed considerably greater than otherwise possible, and at lower cost. We believe we can prove this to the satisfaction of Mr. Falkenberg or anyone else, by demonstration as well as through testimonials from present owners of Statmasters—thus substantiating our remarks.

We can understand the objections to such terms as "mediocre quality" and "slow service". Perhaps in our enthusiasm we have unintentionally "stepped on some toes." Now that this is brought to our attention we shall certainly be less pointed in the future.

Alvin Polland
Statmaster Corp.

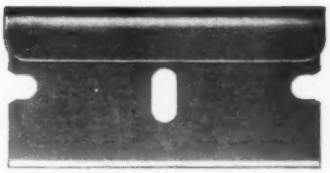
To the Editor:

. . . Last evening glancing over two photographic magazines, I figured that Photo Methods for Industry was the only magazine which I really need. It is to the point and presents factual data without attempting to present glamour and the excessive use of words.

Jesse M. Huffington
Continental Can Co., Inc.
Baltimore, Md.

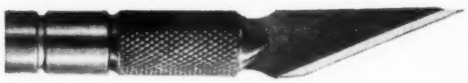
# from Du Pont
# New Ortho B emulsion now on
# two flexible bases

Du Pont now offers you new, versatile Ortho B Litho emulsion with a choice of flexible bases...



**CRONAR® Ortho B on .004" and .007" Cronar® polyester base; Acetate Ortho B on .0055" acetate base.**

Recently we announced fast, wide-latitude CRONAR Ortho B Litho Film, which combines an emulsion representing the optimum balance between high speed and extreme contrast with our dimensionally stable polyester base. Now, this same emulsion is available on regular acetate base, thus providing you with a choice of supports. You can easily standardize on one litho emulsion and select the base most suitable for a particular job.



Acetate Ortho B is designed particularly for those jobs that require extensive scoring and cracking during stripping. And, because of its unusually fine scribing qualities, it is ideal for work necessitating ruling and hand etching.

Why not take advantage *now* of having both CRONAR Ortho B and Acetate Ortho B working for you in your shop. Both films offer wide exposure and processing latitude, retain *all* of the fine detail on line shots and make halftones that have really crisp, hard dots. Try Du Pont Ortho B Litho—on *two* flexible bases.

Call your dealer or contact your Du Pont Technical Representative for a demonstration. E. I. du Pont de Nemours & Co. (Inc.), Photo Products Department, Wilmington 98, Delaware. In Canada: Du Pont of Canada Limited, Toronto.

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**Better Things for Better Living**
***... through Chemistry***

*® Symbol and CRONAR are Du Pont trademarks for polyester graphic arts films.*

This advertisement was prepared exclusively by Phototypography.

**Get more information. Circle 422, page 61**

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THE ONE
ULTRA FINE GRAIN
DEVELOPER
THAT DOES THE WORK
OF TWELVE
... and much better!
High contrast ... high speed ...
low contrast ... fine grain ...
proportionate ... soft working
Frustrating isn't it? The biggest problem after taking a picture is what developer to use.
Now — with ethol's UFG — you can solve any processing problem and get ultra fine results with any kind of film in an average developing time of 3 to 6 minutes.
Use it and you'll agree, for your finest shots, no other developer will do.
FREE TRIAL OFFER
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UFG
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1770 W. Berteau Ave. • Chicago 13, Ill.
Ask your dealer about ethol's 2 for 1 deal TODAY!
Get more information. Circle 459, page 61

by Lloyd E. Varden

# PHOTO METHODS FOR TOMORROW

**20 questions again: here are the answers to quiz in April column**

**QUESTION:** If a lens is stopped down from f/1.5 to f/2.9, by what factor is the light at the focal plane reduced?

**ANSWER:** Approximately by a factor of 3.7 times. The f-numbers first must be squared, and then the smaller number is divided into the larger number to obtain the factor. Thus, 1.5 squared is 2.25 and 2.9 squared is 8.41. Dividing 2.25 into 8.41 gives approximately 3.7.

**QUESTION:** Explain why a negative may sometimes exhibit a different contrast when used for contact and projection printing?

**ANSWER:** The densities of a negative are not absolute quantities, but must be specified according to the method of measurement. If the sensing head of a photoelectric densitometer, for example, is placed in *contact* with a film negative for measuring its densities, the values will correspond quite well with the effective printing densities of the negative when it is used for contact prints. The density scale of the negative will correlate so well with practical results that it can be applied for determining the most suitable contact printing paper, i.e., the paper whose log exposure scale comes closest to the density scale of the negative. (I realize that other considerations are often involved, but in a broad sense what I have said is valid.)

But if the same density values were used for choosing the exposure scale of a projection paper when enlargements are to be made from the negative, a sizable error probably would be noted. In an enlarger the negative is not in contact with the printing paper. Its densities, as previously recorded, no longer apply. Light, in passing through the negative, is scattered by the silver image. Some of the light emerges at such acute angles that it cannot be collected by the lens of the enlarger, thus, is not effective in exposing the paper on the easel. The less the amount of light received by the printing paper from a negative area, the higher the density of this area as far as the paper is concerned. But the subject is more complex.

The extent of light scattering in projection printing depends upon the type of optical system used (diffused light source—with or without condensers—or a system designed to provide a high proportion of specular light; amount of internal light reflection; type of projection lens; etc.) and the over-all density level of the negative. If light scattering in an enlarger is severe, the effective density scale (printing contrast) of a negative can be less than its density scale effective in contact printing. On the other hand, an enlarger with a well-designed condenser system and a minimum of light diffusing elements can convert a negative that has a relatively flat contact printing contrast into one of apparently normal or even high contrast. The reason for this is the fact that in such an enlarger the light scattering produced by the silver particles in the negative itself is not overshadowed by diffused and scattered light due to other causes. Therefore, the increase in light scattering according to the amount of silver in different parts of the negative results in a higher printing contrast, because now the "specular" densities of the negative come into play.

**QUESTION:** What is the meaning of the term "gamma" in photography?

**ANSWER:** Gamma means only one thing in photography. Defined formally, it is the slope of the straight line portion of a D-$\text{Log}_{10}$E curve. A D-$\text{Log}_{10}$E curve is obtained by plotting the densities of a processed strip of film that initially had been given a known range of exposures, either continuously or in steps, such that each density is associated with the logarithm of the exposure responsible for it. The conditions and method of exposure, as well as development specifications and density measurement details, are essential for proper evaluation of the curve. The slope of the straight line portion of the curve is conveniently derived by determining the tangent of the angle which this line

(*continued on page* 12)

# AUTOMATIC Canonflex!

*...the last word in single lens reflexes*

## speed

Only AUTOMATIC CANONFLEX offers Trigger-Action, permitting rapid fire shooting as fast as 3 exposures per second. The camera *never* leaves your eye . . . it's always ready for action . . . lightweight, compact, with a 'just right' feel.

## automation

The image *never* leaves your view . . . mirror is always in viewing position, lens diaphragm always open . . . except for the imperceptible split-second during actual exposure. Shutter-coupled exposure meter accessory sets proper exposure automatically – quickly!

## versatility

Interchangeable prism and waist level finders . . . split-image rangefinder for split-second focusing. Full range of accessories and bayonet-mount Canon lenses to 1000mm. PLUS whisper-quiet shutter, self-timer, single speed control to 1/1000th, and many more features make this the leader among reflex 35's.

**$299.95** with Super Canomatic 50mm f1.8 Lens. At Franchised Dealers NOW!

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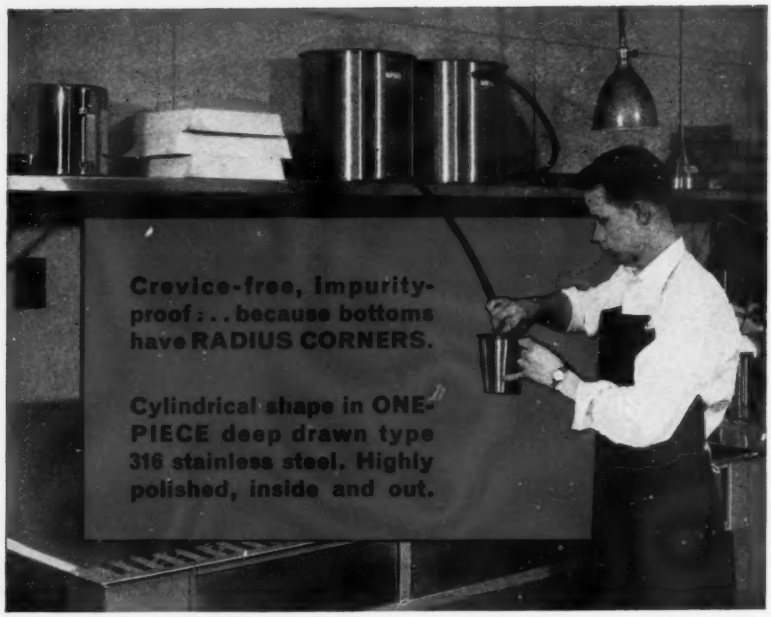
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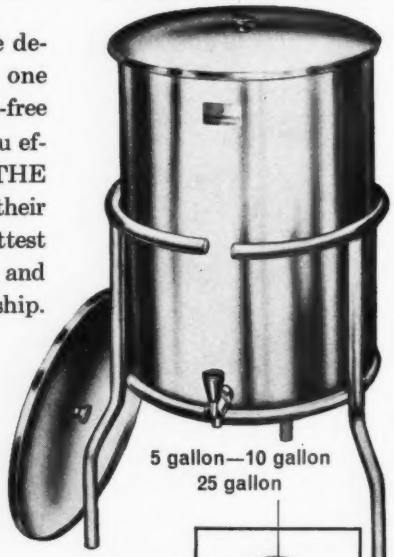

5 gallon—10 gallon
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## METHODS FOR TOMORROW

(*continued from page* 10)

makes when it is extended to the base line of the graph.

Being a "slope" value, gamma expresses a rate of change. Namely, the rate at which density changes with respect to log exposure increases.

**QUESTION:** Is it possible for a negative developed to a gamma of 1.2 to have a lower printing contrast than a negative (exposed to a different subject) developed to a gamma of 0.6?

**ANSWER:** The answer to this question often clarifies the meaning of gamma for students who have gotten into the habit of considering gamma as synonymous with contrast. The popularity of time-gamma curves and tables, plus the strong association of contrast with the extent of development, are probably responsible.

But if one keeps in mind the fact that a negative of *unknown processing history* still can be judged by an experienced photographer with respect to its general printing contrast, then "gamma" will be kept in its proper place. Printing contrast is related to the density range of a negative, and is largely dependent upon the luminance range of the subject photographed. A flatly lighted scene is not conducive to producing a negative of normal density range, even if the film is given 50 or even 100 per cent more development than recommended. The gamma value for an increased amount of development can rise, and usually does, but the density range of the negative gives no clue to this fact.

Likewise, a film exposed to a subject of wide luminance scale can be developed to a low gamma and yet have a typically normal density range.

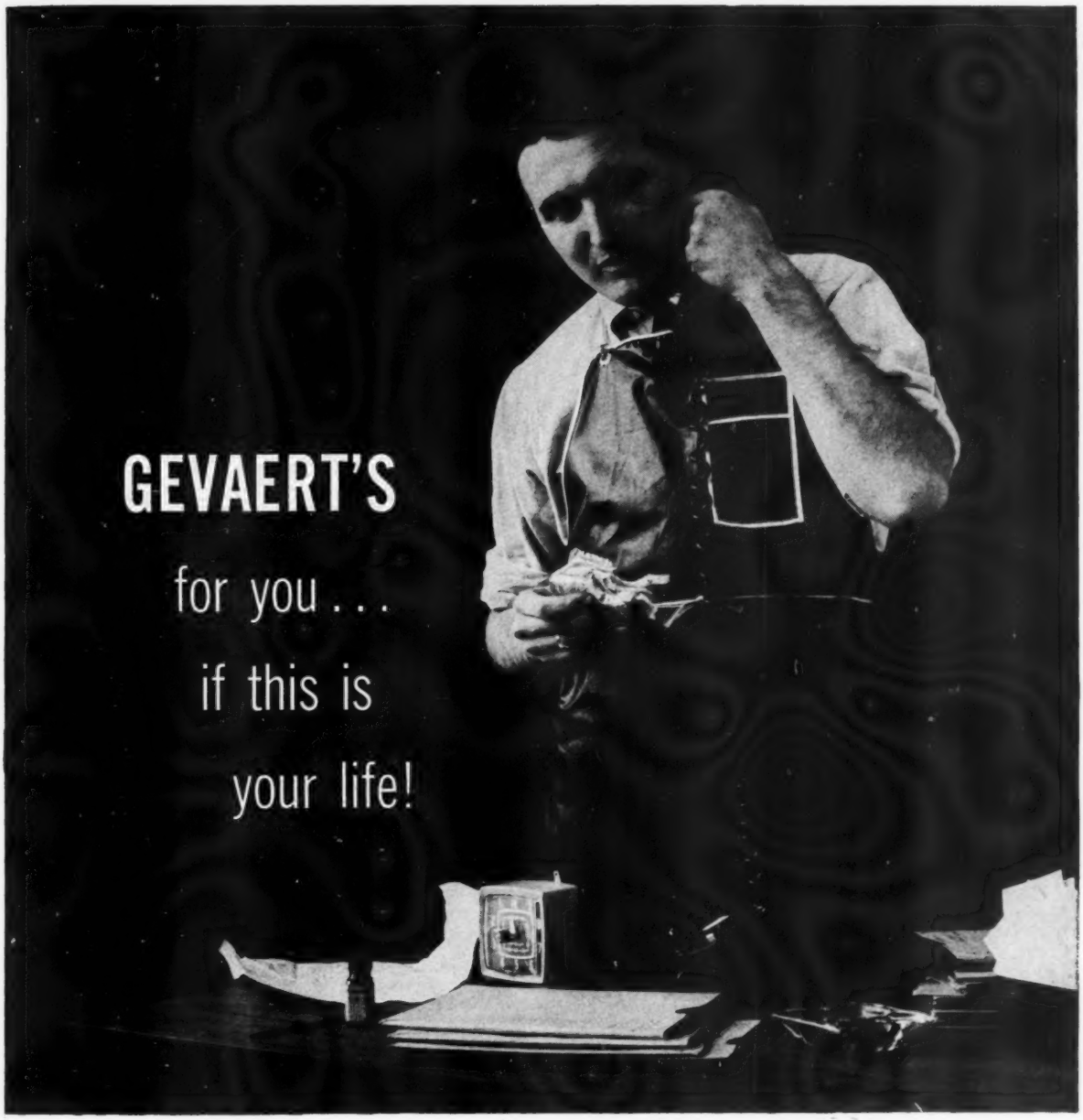
**QUESTION:** Define the meaning and practical significance of photographic reciprocity law failure.

**ANSWER:** A full answer to this question would be quite lengthy. The main considerations, though, can be dealt with rather briefly.

The photographic reciprocity law (once thought to exist) states that for certain light-sensitive materials a constant response is not dependent upon the absolute values of the intensity or duration of the exposing light so long as the product of these two variables remains the same. For example, a silver halide emulsion that obeyed this law would give identical results whether exposed to one unit of light for 1/10 sec. or to 1/10 unit of light for 1 sec., assuming equal processing.

The ideal reciprocal relationship of light intensity and time was shown quite

(*continued on page* 69)

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by Arnold Eagle

# INDUSTRIAL MOTION PICTURES

**Money, money, everywhere — but who gets what and where**

The great fladgit feature is in the can after shooting in record time using nothing but an 8mm camera, two No. 2 floods and a megaphone. The few preview showings have upped sales 1000 per cent, created tons of goodwill, made "fladgit" a part of the American way-of-life and made the powers that be movie conscious. They decide they need a new film, but this time an epic of fladgitry instead of merely a movie. But some spoilsport in the controller's office wants to know how much an epic costs? Being a spoilsport, he wants dollars and cents, not the average temperature in Death Valley multiplied by the number of rainy days in California since 1912. In short, he wants a budget.

Like the 9/10 of a child the average family is supposed to have, the average budget does not exist. There are so many variables that all the film maker can do is set down his probable expenses and allow for as many emergencies as he can. What follows is not a budget, but examples of some items which go into figuring the cost of a movie.

A typical budget is divided into major sections covering the various phases of production; script, personnel, equipment, editing, sound, lab work, film cost, optical work and, of course, administration and miscellaneous. Some of these sections might not apply. For example, if most of the work will be done by in-plant cameramen, there will be no need for "personnel" which covers the cost of extra specialists and assistants. The "script" section covers the fees of a professional writer. "Administration" covers general overhead costs—legal fees, contracts, insurance, releases, film or print loss, etc. For most in-plant productions, the major budget items will be for equipment, processing and, if necessary, special effects. Let's examine these classes and see what is involved.

**Some specific items**

Equipment, both photographic and accessory, is often rented, either by day or week. The figures shown, which come from a leading supply house and may be taken as typical, are daily rates; multiply by five to get weekly (seven-day) rates.

*Cameras*

| | |
|---|---|
| 35mm Mitchell NC | $10.00 |
| 35mm Eyemo 71Q | 10.00 |
| 16mm Cine Kodak Special | 10.00 |
| 16mm Maurer | 25.00 |

All the above include three or four lenses, depending upon turret. In cases where only one lens is needed, fees are less. A 16mm Filmo with one 25mm lens is $5 per day, with 15, 25 and 50mm lenses, $10 daily.

*Lighting Equipment*

| | |
|---|---|
| 150W Spotlight, with stand | $ .50 |
| 500W " " " | 1.00 |
| 2000W " " " | 2.50 |
| Floodlight, single broad | 1.00 |
| Floodlight, double broad | 1.50 |
| Cone Light, 2000W | 5.00 |
| Cable, single feeder *(per ft)* | .02 |
| Bull Switch, 200 ampere | 2.50 |

(*continued on page* 16)

LOCATION & MISCELLANEOUS EXPENSES

| ID | CLASSIFICATION | DAYS | RATE | TOTAL | COST TO DATE | COST TO COMPLETE |
|---|---|---|---|---|---|---|
| 1. | TRAVEL | | | | | |
| 2. | COMMUNICATIONS | | | | | |
| 3. | LIVING EXPENSE ALLOWANCE | | | | | |
| 4. | ENTERTAINMENT | | | | | |
| 5. | SHIPPING | | | | | |
| 6. | PROPS | | | | | |
| 7. | GRATUITIES | | | | | |
| 8. | LOCATION RENTAL | | | | | |
| 9. | OTHER | | | | | |
| | TOTAL | | | | | |

RAW STOCK & LABORATORY COSTS

| ID | CLASSIFICATION | MIN | RATE | TOTAL | COST TO DATE | COST TO COMPLETE |
|---|---|---|---|---|---|---|
| 1. | PICTURE STOCK | | | | | |
| 2. | DEVELOP PICTURE NEGATIVE | | | | | |
| 3. | PRINT PICTURE NEGATIVE | | | | | |
| 4. | SOUND STOCK | | | | | |
| 5. | DEVELOP SOUND | | | | | |
| 6. | PRINT SOUND | | | | | |
| 7. | DIRECT POSITIVE SOUND | | | | | |
| 8. | FINE GRAINS | | | | | |
| 9. | DUPE NEGATIVE | | | | | |
| 10. | REDUCTION NEGATIVE | | | | | |
| 11. | ANSWER PRINT | | | | | |
| 12. | STOCK FOOTAGE | | | | | |
| 13. | TAPE | | | | | |
| 14. | DISCS | | | | | |
| 15. | CODING | | | | | |
| 16. | OTHER | | | | | |
| | TOTAL | | | | | |

BUDGET COURTESY MPO TELEVISION FILMS, INC.

**Sample** page from typical budget. For copy of complete budget, send self-addressed stamped envelope to: Budget, PMI, 33 West 60th St., N. Y. 23, N. Y.

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# AURICON 16mm Cameras for Professional Results!

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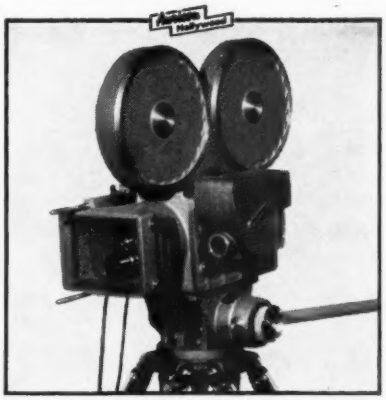
★ 100 ft. film capacity for 2¾ minutes of recording; 6-Volt DC Convertor or 115-Volt AC operation. ★ $795.00 (and up).




"AURICON PRO-600" 16mm Optical Sound-On-Film Camera.
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Get more information. Circle 477, page 61


## IND. MOTION PICTURES

(*continued from page 14*)

*Sound Recording Equipment*

| | |
|---|---|
| Magnasynch X-400 | $25.00 |
| Four Position Mixer | 15.00 |
| Magnecorder | 25.00 |
| Small Portable Mike Boom | 5.00 |
| Mole-Richardson Boom | 15.00 |
| Microphones | 5.00 |

*Raw Stock & Laboratory* (*per ft*)

| | |
|---|---|
| 16mm B & W positive stock | $ .04 |
| processing | .025 |
| 16mm Color original | .06 |
| processing | .05 |
| 16mm sound stock | .02 |
| processing | .025 |
| 16mm B & W release print | .04 |
| 16mm Color release print | .135 |

*Editing Equipment*

| | |
|---|---|
| 16mm Moviola | $12.00 |
| 35mm Moviola | 12.00 |
| Combination Moviola, 3 head | 15.00 |
| 16mm two sprocket synchronizer | 2.00 |
| 35mm ACE viewer | 2.00 |
| 16mm Zeiss Moviescop | 2.00 |
| 35mm Hollywood tape splicer | 2.00 |
| 16-35mm B & H hot splicer | 2.00 |
| Electric rewind | 5.00 |
| Stock footage (*per ft*) | .10 |
| Cutting room rental (*per wk*) | 50.00 |
| Projection room (*per hr*) | 15.00 |
| 16mm Optical sound reader | 5.00 |
| Filmeter stop watch | .50 |
| 16mm footage counter | 1.50 |

Sound and music are charged for on an hourly basis. Recording studio, music or narration, is $75 an hour, plus cost of musicians, technicians, etc. Mixing sound track is $75 an hour, as is re-recording tape to optical. Stock music, per tune, is $15 while sound effects run $2 per record.

Special effects, including art work and titles are charged on a unit basis. Titles, for example, are $25 per title. One minute's animation can cost from $250 to $2,000. Dissolves are $5 for the first print, with fade-ins at $2.50 for the first print.

The above information is a rough guide for preparing a preliminary budget estimate. In actual practice, many film units use a highly detailed breakdown, giving not only the original budget estimate for each item, but the actual costs as of various dates, so that a check is available on how much money is really needed and how much has been spent so far. The important thing to remember is to provide enough flexibility to take care of the many unforeseen events which can make shooting a movie interesting but also expensive.

# NEW Houston Fearless Color Labmaster

## Faster! Better! Easier! Color Film Processing

**SIMPLIFIED OPERATION**
Automatic controls minimize need for personal supervision. Requires minimum of training.

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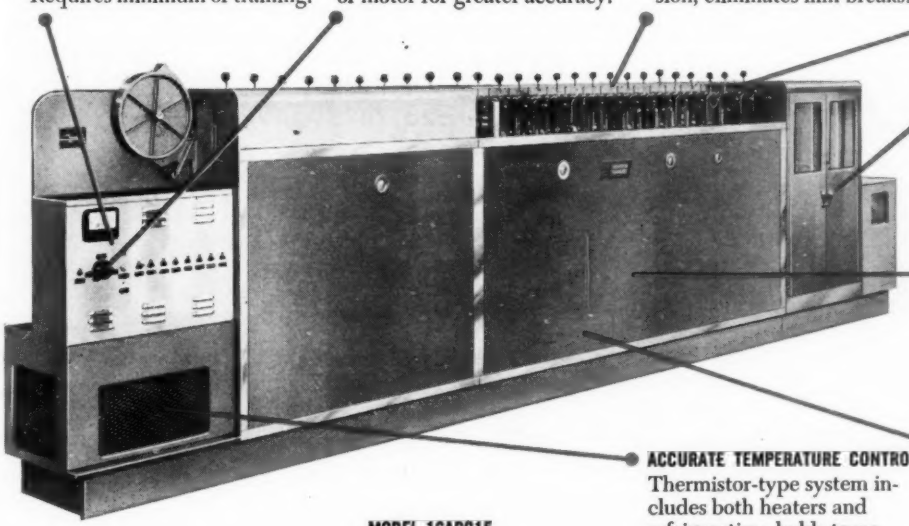

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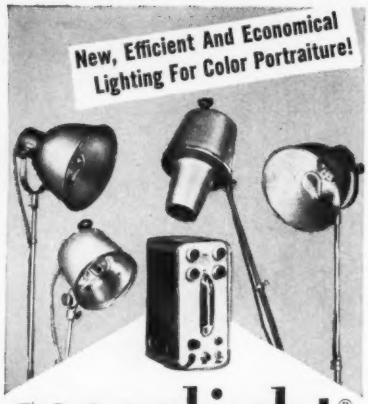


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10. Ascorlight equipment is sold and serviced only by reliable, authorized Ascor dealers who are trained to help you in your selection of Ascorlight equipment.

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**Get more information. Circle 401, page 61**

**by Edward R. Farber**

# ELECTRONIC FLASH

**How to rig up your speedlights so they'll go off automatically**

The "exact instant" must sometimes be exact indeed for the industrial photographer. Human reflexes cannot always be relied upon to synchronize action and picture, so mechanical or electrical systems are resorted to.

If the action can be anticipated by 10 milliseconds or more, then a solenoid is probably the answer. The action closes a switch which activates the solenoid, which trips the shutter, which if equipped with built-in electronic flash contacts can set off speedlights. There are some technical points to consider when setting up an automatic solenoid trip device:

The addition of batteries via an extension tube on the flashgun reduces the time it takes the solenoid to open the shutter. Most solenoids can be mechanically advanced or retarded. The advantage of using batteries alone is that the solenoid need not be re-synchronized afterwards for use with flashbulbs.

Because a solenoid works on low voltages, all connections should be solid, clean and tight. Furthermore the batteries must be fresh, the leads heavy and short and the contacts closed for a relatively long time if reliability is expected.

Either a set of brush contacts on a moving part or a microswitch is perhaps the best means of triggering a solenoid.

The use of a solenoid is usually convenient and inexpensive. Most photographers have all the necessary equipment and it needs only the most superficial modification. It permits high shutter speeds. Usually, however, at least 1/100 sec. is required between contact and the time a picture is made.

When even quicker reflexes are required to do the job, photographers often use a relay connected directly to an electronic flash unit. Relays are able to close a circuit and set off an electronic flash with as short a delay as 2 milliseconds. A direct pulse is even faster, as short in fact as 100 microseconds, but it

(*continued on page* 20)

Electronic burglar alarm automatically closes circuit when light beam is interrupted

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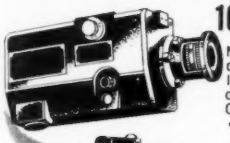

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Made to highest Gov't. standards. Electrically driven, 24 volt. 16, 32 and 64 frames per sec. Ideal for instrumentation and other special purpose use. Comes with 1⅜" f3.5 lens.

* Gun Sight Aiming Point

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## OMEGA D-2 ENLARGER FREE CASE INCLUDED

Used but in excellent condition. With 4 x 5 condensers, film holder and your choice of 5⅜" f4.5 or 6⅜" f4.5 lens. Fine professional equipment. **List price is over $300.**

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With 35mm condensers, film holder and 50mm f4.5 lens.....**$129.65**

For COLORHEAD add 10.00 to above

## ANSCO 8 x 10 CONTACT PRINTER

20 individually controlled rapid-printing Argon lamps. Pneumatic platen! Prints wet or dry negatives. Built-in viewing and safelamps. Movable center stage, filter slots, and many other features. Original cost, $412.00.

WITH BUILT-IN ELECTRONIC TIMER! .....**$89.65**

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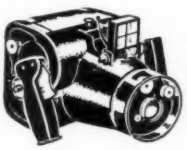

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Original Gov't. cost was $700.

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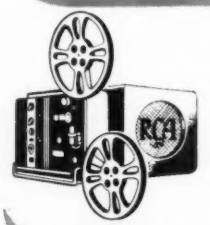

## RCA PG-200 16mm SOUND PROJECTOR

Brilliant theatre-type projection. Separate speaker. 2" lens. 2000 foot capacity for feature length shows. Sound drum is stationary type with full scan condenser lens and heavy-duty exciter lamp. 750 watt lamp.

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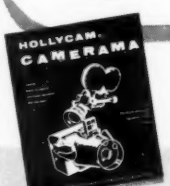


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Get more information. Circle 434, page 61

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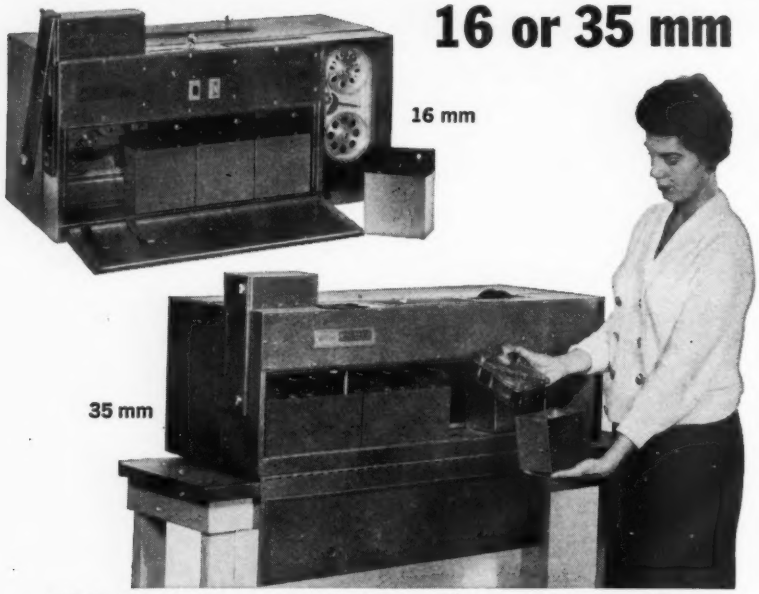


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| SPECIFICATIONS | 16 mm PROCESSOR | 35 mm PROCESSOR |
|---|---|---|
| SIZE | 13" high (16" over film compartment) x 13" deep x 27" long | 13¼" high (16" over loading compartment) x 14½" deep x 36½" long |
| WEIGHT | 65 lbs. | 120 lbs. |
| SPEED | 2 fpm to 6 fpm, variable during processing | 1 fpm to 4 fpm, variable during processing |
| CAPACITY | 2 ft. to 400 ft. | 2 ft. to 400 ft. |
| PLUMBING | None necessary. Circulating wash attachment available. | None necessary. Circulating wash standard. Replenishing system standard. |
| POWER | 110-120 volts, 60 cycle a.c. | 110-120 volts, 60 cycle a.c. |
| DRYING | High velocity hot air | High velocity hot air |

Get more information. Circle 425, page 61


## ELECTRONIC FLASH

(*continued from page* 18)

can operate if and only if the electronic flash unit is equipped with a trigger tube. It's often simple to rig up an electronic tripper to provide a pulse of the proper polarity for a trigger tube. But if a unit has no trigger tube, the photographer must either be content with a slower acting system or provide a trigger tube for his electronic flash unit. To adapt a unit without a trigger tube, however, one must start with a complete circuit diagram containing all values and voltages. No general recommendations are possible.

One of the devices that will set off an electronic flash unit automatically is an electronic burglar alarm. Such a device can be bought for about $35 (and up). It closes a circuit when a light beam is interrupted. Lafayette Radio, 165-08 Liberty Ave., Jamaica, N.Y., and Allied Radio, 100 N. Western Ave., Chicago, Ill., as well as other firms, offer a burglar alarm kit.

If two alarms are used the photographer can arrange the two beams to cross and focus on the intersection—making it possible to take close-ups with precise framing, focus and exposure. Infra-red filters used on the light sources render them invisible.

A microphone plus an ordinary amplifier offer another possibility. They can feed a sound pulse into a relay and thus time the smashing of a light bulb or the impact of a stone on safety glass. By moving the microphone close to or further from the subject the delay time can be varied.

A so-called capacity or proximity relay will respond to the presence of a person's hand or a mass of any sort. You find circuits for these in electronics handbooks or you can buy a kit for about $15.

Other systems are useful only with trigger-tube systems (which require only a small current—50 microamperes for only a few microseconds).

Aluminum foil type insulation with foil on both sides conducts electricity when pierced by a bullet or a knife. Two thin wires (or sets of them) stretched taut at right angles a fraction of an inch apart make contact when flying particles hit them.

A magnet moving in a coil of wire can produce a voltage that can be applied to a trigger tube.

The sudden change in current in a coil (coupled to the trigger tube) when an iron slug passes through can also set off lights. This method is used to photograph shells fired through large loops of wire in ballistics laboratories.—THE END

# THE PROGRAM OF

# THE 7th NATIONAL INDUSTRIAL PHOTOGRAPHIC CONFERENCE

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## STATLER HILTON HOTEL — LOS ANGELES — JULY 26-31

### SUNDAY, JULY 26

9:00 Registration Center Open—Statler Hilton Hotel
10:00 Pre-Council Meetings—Industrial Division
2:00 Opening of Trade Show—Statler Hilton Hotel
8:40 "The European Photographer"—James A. Stewart

### MONDAY, JULY 27

7:45 Continental Breakfast—Garden Room
9:00 "Off-Beats Attract Attention"—Alex Anderson, VP, Guild, Bascom & Bonfigli, San Francisco
9:40 "The Still Photographer & Motion Picture Assignments"—John P. Breeden Jr., Ford Motor Co.
10:35 "Preparation of Film Reports"—Warren G. Kemmer, Convair-Astronautics, San Diego
11:15 "Time-Lapse Photography"
11:50 "Getting the Most Out of the Small Negative"
2:00 "New Products"—David B. Eisendrath Jr., PMI
3:00 Industrial Roundtables and Trade Show
8:00 "Motion Picture Cliñic"—David B. Eisendrath Jr.

### TUESDAY, JULY 28

7:30 Continental Breakfast—Garden Room
Field Trip—USAF Flight Test Center, Edwards Air Force Base. Bus leaves hotel at 8:00 a.m.
10:00 Welcome—Col. Charles A. Brown, Lt. Col. Strandberg. "Requirements for Photography at Flight Test Center" — Photo Branch Representative; "Quantitative & Qualitative High-Speed Photography"—William G. Hyzer, Consulting Research Engineer, Janesville, Wis.; "Infrared Photography" — Karl-Heinz Lohse, Aeronutronic System, Inc.
11:45 Tour Photo Branch Facilities
12:30 Tour Flight Line
2:45 Witness 20,000-Foot Sled Run and inspect photo equipment installation

### WEDNESDAY, JULY 29

7:45 Continental Breakfast—Garden Room
9:00 "Engineering Drawing Miniaturization—Techniques for Maximum Benefits"—M. G. "Buzz" Holland, North American Aviation Inc., Los Angeles, plus panel of six representatives of equipment and systems development companies.
2:15 "Sports Photography"—James F. Laughead, Dallas
2:30 Industrial Roundtables and Trade Show
3:15 "Angles for Architecture"—Frank Lotz Miller, N.O.
7:30 Annual Awards Banquet—Statler Hilton Hotel

### THURSDAY, JULY 30

7:45 Continental Breakfast—Garden Room
9:00 "Color Photography in Industrial Advertising"—Clarence Hansen, Allis-Chalmers, Milwaukee, Wis.
9:40 "Large Areas in Color"
10:35 "Color and the Industrial Photographer"—G. E. Keeney, Rapid Colorprint Co. Inc., Glendale; Len Zoref, Kurshan & Lang, New York; Ulric E. Meisel, Meisel Photochrome Corp., Dallas; Philip J. Letourneaux, Color Technique Inc., Chicago.
1:15 Industrial Division Luncheon—Speaker from Space Technology Lab
3:00 "Methods Forum"—James E. Hampson, M. Photog., Arkansas Fuel Oil Corp., Shreveport
9:00 "Sermons from Science"—Dr. Irwin A. Moon, James Moon, F. Alton Everest, Moody Inst. of Science, LA

### FRIDAY, JULY 31

7:45 Continental Breakfast—Garden Room
9:00 "The Mechanics of Visual Presentations"—Walter Lawton, Stanford Research Institute, Menlo Park
9:40 "Techniques & Applications of Diazo Materials in Visual Presentations"—James Cooper, U of Michigan, Willow Run Labs, Ann Arbor
10:35 "Photographic Tools in Etched Circuit Manufacture" Robert E. Goode, Hughes Aircraft Co., Tucson
11:15 "Low Cost Printed Circuits by the Photographic Process"—Tom Negro, Collins Radio, Cedar Rapids

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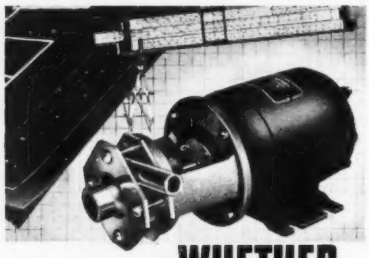
**(Fee for wives and immediate members of family is $9.50 each.)**



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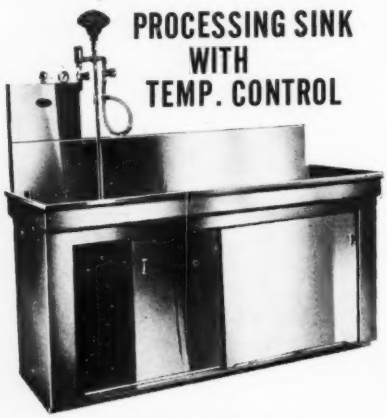

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by David B. Eisendrath, Jr.

# WORKING PHOTOGRAPHER

**More comments on method and technique: a trick in time saves**

Last month I discussed one of the highlights of the National Industrial Photographic Conference—a session called "Methods and Techniques Forum" which is held each year, conducted by Jim Hampson, chief photographer for the Arkansas Fuel Oil Corp. This is a program where Jim gets people from the audience to tell about the handy-dandy tricks they use in their photo departments to save time, annoyance and headaches with some ingenious device or system they have developed or stumbled upon. To me, this part of the Conference has always been most informative, even though it is an informal meeting. There are those people who think the letters to the editor are always more interesting than the actual content of a publication itself; those of us who like techniques and gadgets probably feel the same way about the audience participation programs in general.

Because I feel that many of these very ingenious ideas should be recorded somewhere and that my readers (I presume them to be WORKING photographers) will find some of them helpful, here are some more from the 1958 Conference.

**Carton holder**

Richard Kinstler of Procter and Gamble told that they had to make a good many photographs of cartons in which products are shipped. (At many plants a photograph of a carton spread open is used as part of the specs sent to suppliers to show where printed legends, folds and slits are to appear.) Dick said that they had a problem holding the spread-out cartons for photographing until they came up with a cute system of using pegboard background and a special holder for holding the cartons flat. The special holder consists of a large 1-in. washer or metal disc in which a hole has been drilled near one edge. A screw is put through the hole into a peg that fits into the pegboard. This gives them an off-center holding finger. The pegs are put into place in holes slightly farther apart than the carton dimension, and the washers or discs are then turned to hold down the edges of the cardboard. They also use this as a copy board for big art work.

Dick also told how they had saved the company a lot of money by making posters. They set type on their PhotoTypesetter in letters up to 2 in. high. Prints are made on Kodagraph Contact paper, the whole poster is assembled and either copied photographically or run through a diazo machine for further reproduction.

**Etched bottles**

Jim Hampson then told how they labeled bottles in their darkroom by masking off an area of the glass with masking tape and applying a coating of a material called Etchall (Etchall Products, Columbia, Mo.) which is left on for a short while. When it is washed off, it leaves the glass etched and frosted so it can be written upon. Jim added that they not only write the contents of the bottle, but the date of mixing. This kind of label does not wash off when bottles are warmed or chilled by standing in a temperature bath; the written data, however, is easily removed when desired by any scouring powder.

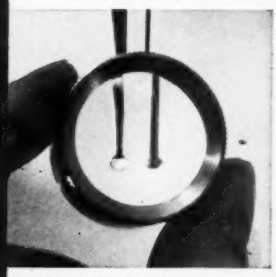
Dick Kimble of Westinghouse then told how they prepared simple color slides of drawing and text material inexpensively by preparing the original in black-and-white, sending this through a diazo machine onto one of the color or multi-color diazo foil materials like Tecnifax Tecnichrome, Varicolor (KVR) or similar products. These brightly colored foils can be further tinted by hand if desired and then production slides made by copying these on Kodachrome or Anscochrome.

Gerry Davenport of the University of Michigan Research Institute showed a clever trick of using one of those envelope moisteners which is a plastic tube with a sponge in the end

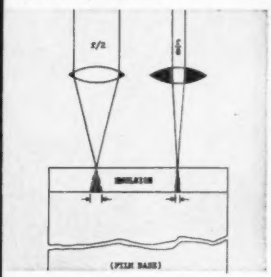
(*continued on page* 24)

# VERSATILE
## TOOL FOR INDUSTRY

PHOTOMICROGRAPHY—Steel surface greatly magnified through LEITZ microscope, recorded by LEICA. Diamond impressions made by LEITZ tester indicate degrees of hardness.



MACRO PHOTOGRAPHY—Common pin and an unfinished micro-optic under magnifier, photographed with LEICA, lens extension and VISOFLEX. Photo by Liesel Springmann.



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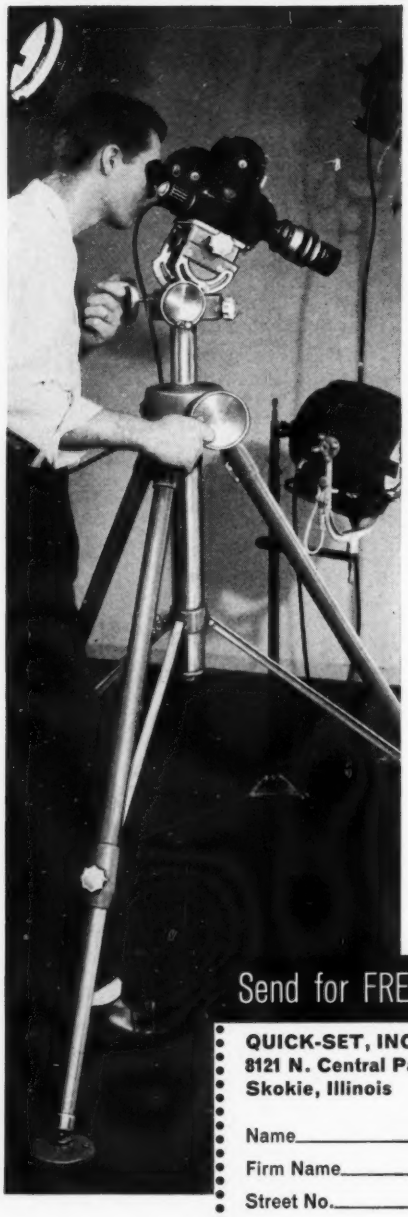

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## WORKING PHOTOGRAPHER

(*continued from page 22*)

(Oasis Moistener is the one I now use) for wetting lantern slide bindings. I added a note, at this point, that Walter Lawton of Stanford Research Institute had told me they had discovered an interesting new slide binding tape in 3M's Scotch Electric Tape No. 3. This is a paper tape which is thermo setting. After the slides have been bound, you project them once and the heat makes the binding permanent.

Roland Will of the University of Michigan Willow Run Laboratories showed how they had made a very solid, shake-free camera stand for studio and close-up work by using the base, upright and table of a drill press stand. He also showed how they had solved a space problem for drying 8 x 10 and litho negatives. When they have heavy production, they set up one of those clothes dryer trees that is an aluminum pole with arms and ropes. He says they can hang about 100 negatives on their Montgomery Ward clothes trees using spring pins. When it is not in use, it is folded up and stored.

Jim Howard of Interchemical Corp. Research Laboratories then added a few ideas by telling about a small geared mount they made to hold an optically flat first surface mirror used to photograph hard-to-get-at places. The mirror, rigidly held and accurately adjustable, can be placed in small spaces. He can then shoot into it, picking up the image of his subject as seen from a point inaccessible to the camera. Jim also said that he used a small General Radio microflash unit, but that for photographing at high speed in small areas where he couldn't put this bulky unit, he had mounted the lamp *out* of its housing in a small Plexiglas tube and on an extension cord.

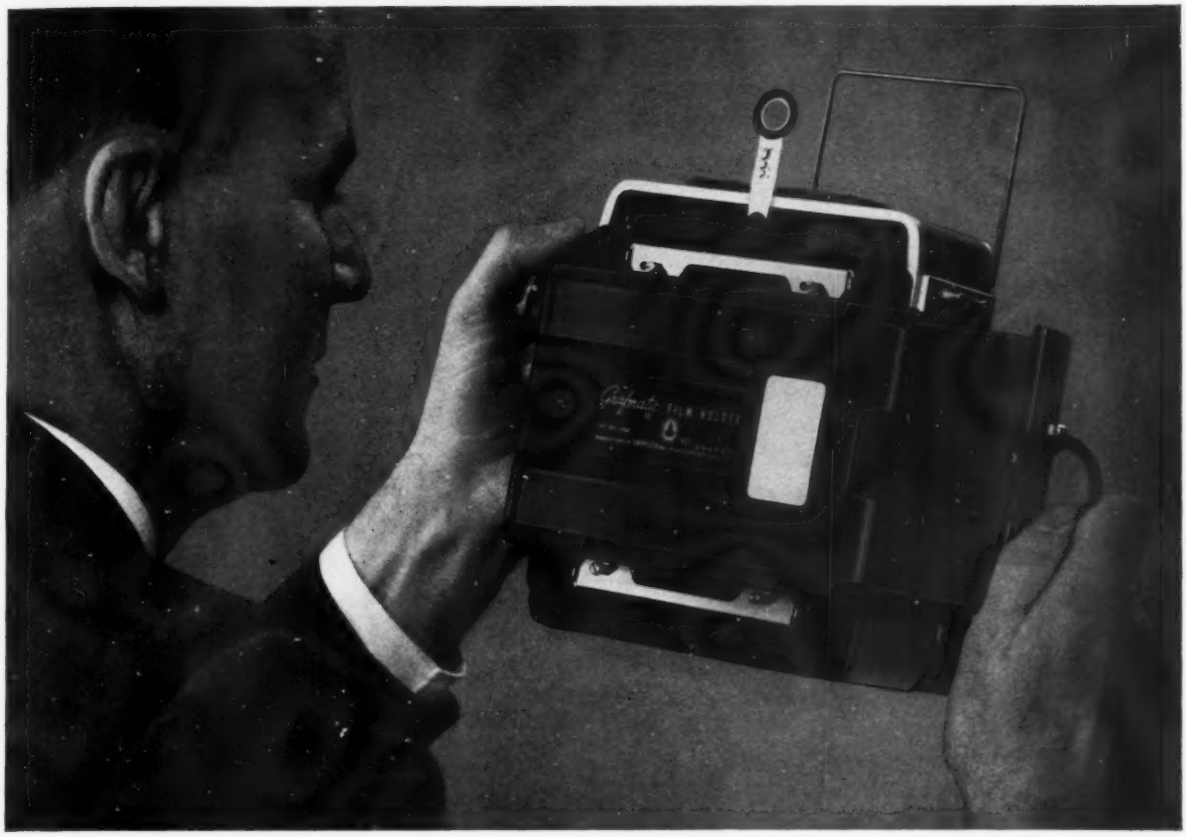
### Dryer timer

William Terrell, Service Pipe Line Co., told how he had adapted one of those timing devices used for attic fans to his print dryers. The timer was used for heating up the dryer in the morning so it was ready for use when the early day-crew came in. At night, it waited until the dryer had cooled off before turning off the belt mechanism; this allows them to work until quitting time.

You can see that one of these Forums can pay off very well for a photographer; one such session may well be worth the whole cost of attending the conferences in money-saving ideas. See you in Los Angeles.

# GRAFMATIC*

## BY GRAFLEX



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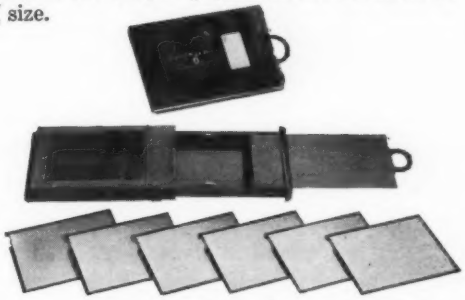

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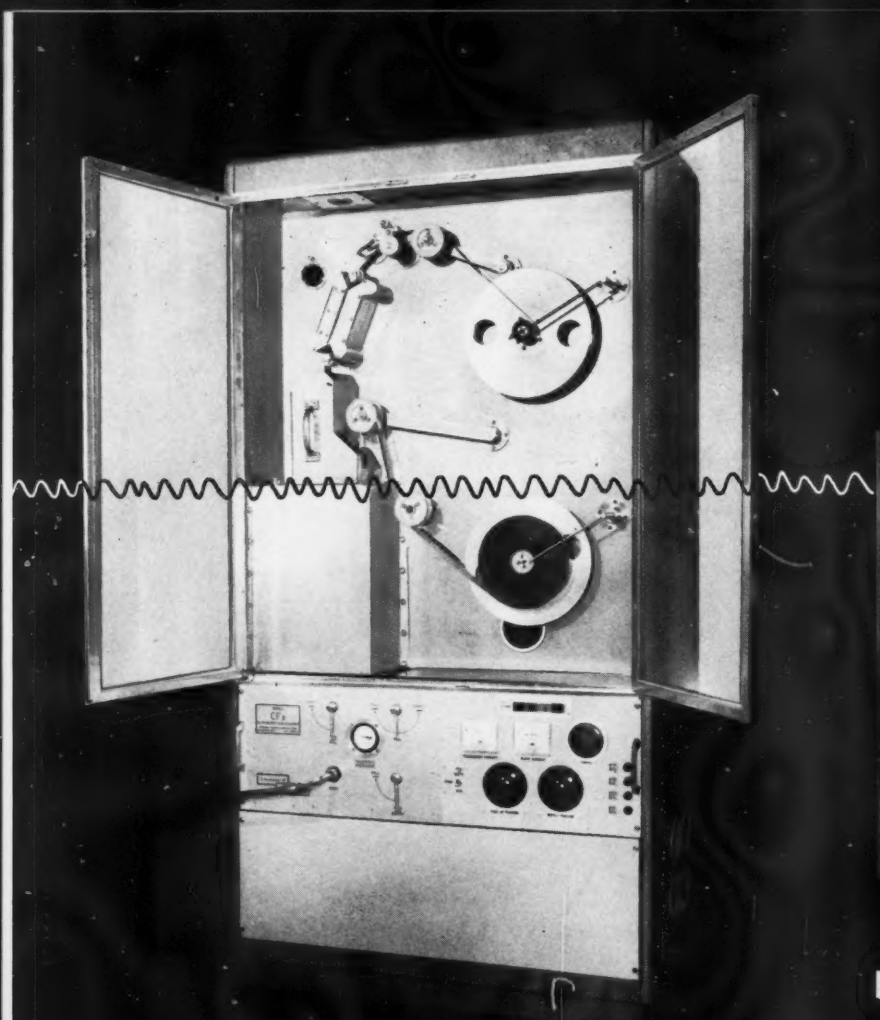
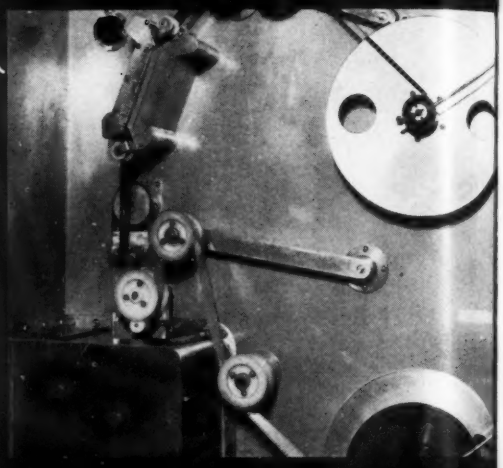
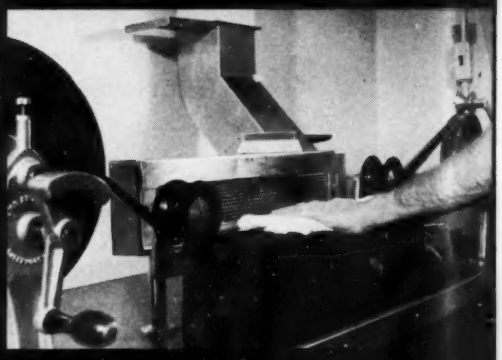


Adjusting the new ultrasonic film cleaner for optimum performance



Elevator automatically lowers film into ultrasonic cleaning chamber



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AN EDITORIAL

# THE AUTOMATIC REPRODUCTION MAN

Today, as many of the stories in this issue of PMI point out, automation is making its weight felt in the industrial application of reproduction photography. From feeding the white-printer faster to using an automatically-made microfilm image as the master negative for automatically-made offset plates, things are speeding up.

Some writers, indeed, express the opinion that some day almost every repetitive task in industry will be lifted from the hands of the worker and placed in the maw of a machine. This robotizing of what we've come to feel is a highly skilled set of crafts has its frightening aspects. Surely if one machine comes which will do the job of four men, then four men will suddenly need more work. In the typical reproduction and graphic arts installation, however, the cry for paper work is so loud, the need so great, the work load so heavy, that some form of relief is welcome—robot or not. A few figures illustrate the general situation. Industry estimates for the total tonnage of paper for blue and diazo-type paper in 1949 were 24,000 tons before sensitizing. Nine years later, in 1958, the total had risen to 54,000 tons. The expanding nature of industry and its shift toward more technical complexities indicates nothing but greater heaps of work for the reproduction department.

It would seem that the few rivulets of automation detectable now are small compared to the rivers of the paper turned out today in the service of industry. But if the onrush of automation does catch up with the current need, what is to happen to the man, the reproduction worker? The consensus is that he will be needed less and less for his manual dexterity and more and more for his ingenuity in solving the problems of getting paper work out fast and well. They say, and we are inclined to agree, that his survival depends upon his gaining more knowledge to assess, and be able to put into practice, the automation in graphic arts and reproduction we can surely expect.

The Editors

AND
REPRODUCTION

# STAVID
## ENGINEERING, INC.

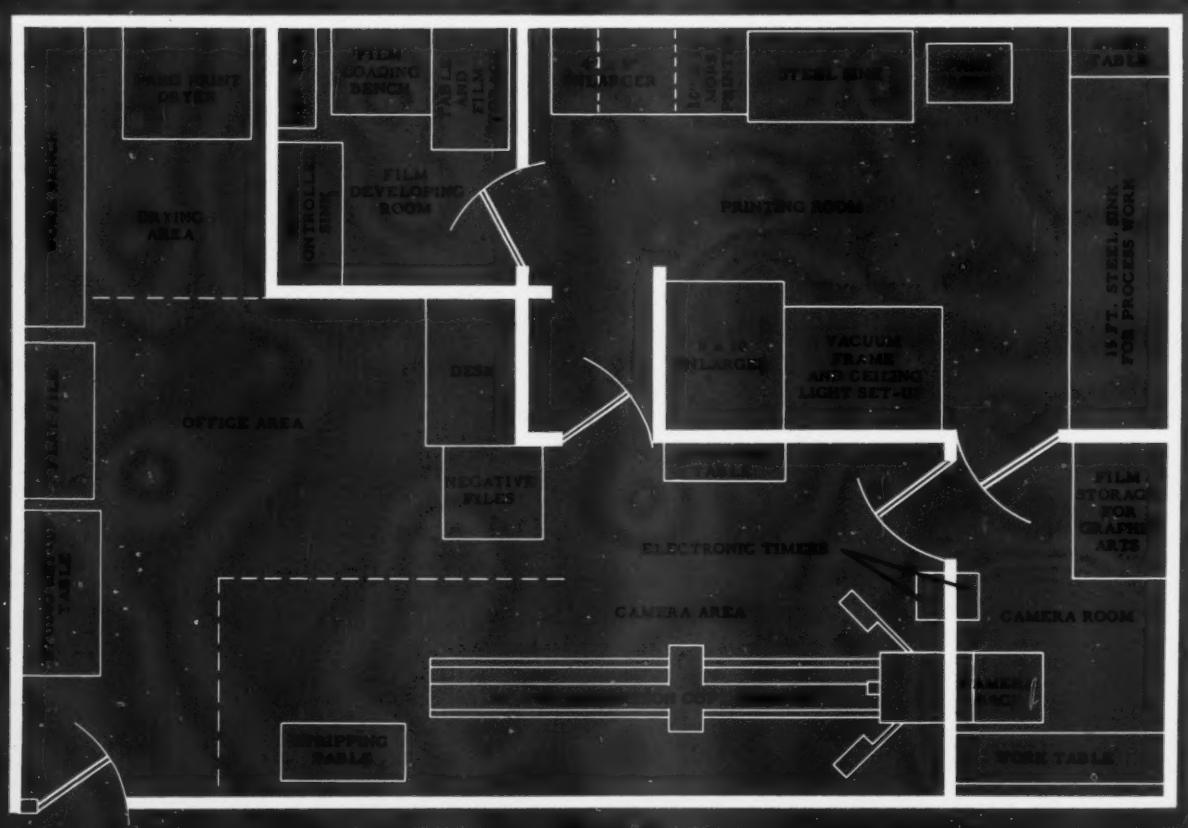
**With the work divvied up between a three-man photo staff and four reproduction machine operators, Stavid Engineering's photo unit has to hustle to turn out close to half a million pieces of work annually.**

**Photo Department Analysis No. 16 Morton J. Schultz**

Although it employs only 1000 people, Stavid Engineering of Plainfield, N.J., a developer and manufacturer of electronic equipment, has a photographic-reproduction facility that many industrial "giants" might find comparable to their own.

Last year the three photo technicians and four reproduction-machine operators produced 35,000 black-and-white prints, 6,000 offset printing negatives, 400,000 diazo prints, 1,300 printed circuit negatives and 500 projection slides. And every piece of work must meet the rigid specifications of the military, Stavid's principal customer. For example, a routine job is the production of composites of from four to ten different images, laid out accurately to within 1/32 in., on one piece of enlarging paper.

Although it supports all vital areas of the company's operation, the Photographic Section's main re-

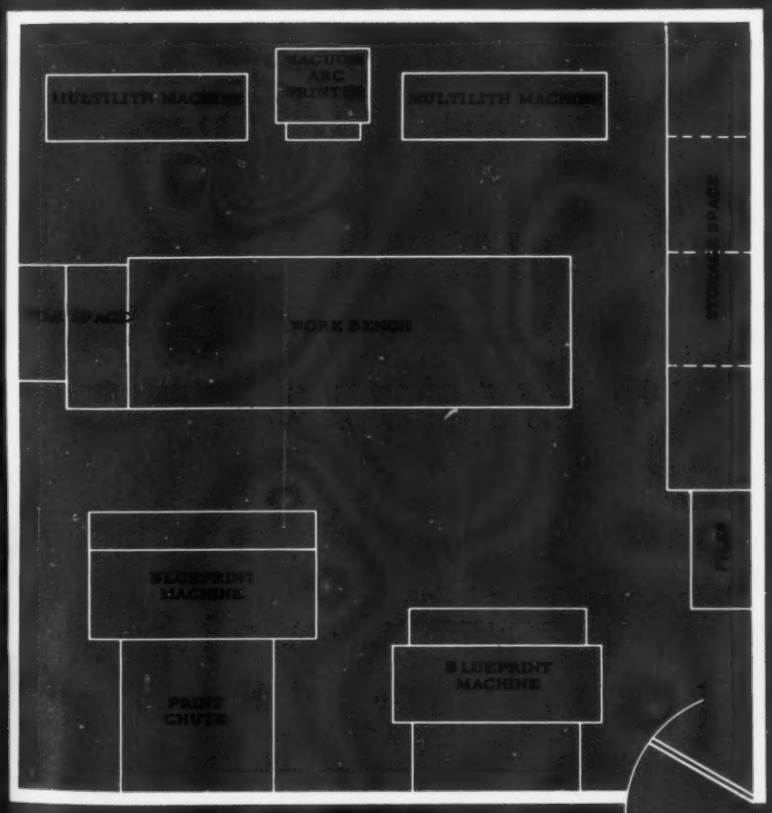


sponsibility is to assist the Technical Publications Department in preparing manuals, engineering reports and other technical literature. Therefore, it is assigned organizationally to this department.

Generally, work for Technical Publications includes producing photographs that illustrate complex electronic equipment, reproducing draft manuscripts for approval purposes, providing reference prints to technical writers and illustrators and processing reproduction work for the Department's art section, including line and halftone negatives for offset printing.

Besides an array of still cameras from 8 x 10 to 35mm and a motion picture outfit, basic equipment includes a 30 x 40 Robertson reproduction camera for line, halftone and continuous tone reproduction and a 30 x 40 contact vacuum frame to preserve size and sharpness on

**In clutter free** printing room John Semonish dusts enlarger lens; Photo Chief Hal Denstman discusses job with Kenneth Bowdish. Stavid finds that their neatness counts



Section Chief Denstman

**STAVID'S THOUSAND SQUARE FT.: THEY GET ACCURACY TO .005 IN.**

In the photographic department (diagram at *left*) Stavid's three photo technicians turn out prints, visual aids, process negatives for printed circuits where tolerances are held to 1/128 in., and line and halftone copy for photo offset and diazo reproduction. The reproduction room (right) is manned by a crew of four who work closely with the photo group in the reproduction of engineering drawings, technical reports and proposals. Since chief customer is the United States Military, visitors are prohibited from both areas.

all the contact process work.

Some of the section's work for Technical Publications involves producing positive halftone masters directly from continuous-tone negatives, for direct reproduction through Stavid's two diazo machines. The negative is placed in the enlarger, enlarged or reduced to the proper size, and projected through a magenta screen onto high contrast film in an 11 x 14 contact frame. This process, used in preparing halftones for inclusion in short-press-run approval and final drafts, has cut material and time costs 90 per cent. Since it was instituted, Stavid estimates that the diazo operation has saved the company 2½ manhours and $1.50 in material for *every* photograph destined for a short-run draft manuscript by eliminating the screening, stripping and plate-making phases of photo offset. Diazo reproduction is also used in turning out oversize drawings for foldout pages.

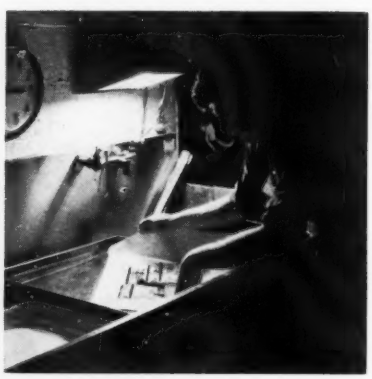
When it comes to copying continuous-tone originals two films are standard at Stavid—blue sensitive commercial film for high contrast continuous tone originals and Kodak Gravure Film to copy those originals within the normal range.

When photocopying a silhouette continuous-tone original, the white background of the copy print often renders grey. This raises problems for the printer who is required to produce offset prints having even backgrounds. But some contracts provide that a to-size photograph be furnished. To give the printer a suitable silhouette print from which he can make an acceptable screened negative, Stavid's lab uses Kodak Gravure Film and Kodak D-11 Developer. By overexposing 15 per cent and overdeveloping 25 per cent a good silhouette image is produced.

A word about time requirements imposed on the photo section when it does a job for Technical Publications: because most work is done for the armed forces, everything is on a crash basis. One-day service is routine—one-hour service is rush.

Another important responsibility of Stavid's photographic section is the making of photomechanical reproductions for printed circuit boards. Again, military specifica-

## 3-MAN CREW MUST DOUBLE IN BRASS



John Semonish finishes print. Lab handles sizes to 24 x 36 routinely

Magenta screen in contact frame produces halftones for whiteprints

30 x 40 contact vacuum frame and arc lamp turn out direct positives

Transilluminating printed circuit designs to eliminate frontal reflections

Oscilloscope recording is reduced to a system for all machines used

Kenneth Bowdish, like his workmates, handles every kind of camera job

# REPRODUCTION TEAM COMPLETES CYCLE

Whiteprinter, run by Mrs. Bessie Wood, runs line, halftone work

Artist Frank Cosman makes offset flat from photo crew negatives

Flat is exposed on plate by pressman Donald Grozmann with arc lamp

tions require that tolerances be held to within 1/64 in. Stavid's lab technicians, constantly seeking Rube Goldberg gimmicks to accomplish their assignments more efficiently, have cut this required tolerance figure to 1/128 in. One of the tricks is a focusing target with which Stavid's men check camera alignment daily.

Although printed circuitry is widely used in the electronics industry, many problems still remain because the process is relatively new. A big problem for industrial photo labs has been lighting. Standard lighting is from the front at a 45° angle to the subject. This type of lighting, however, produces reflections on the black tape used to lay out the circuit. The reflections must be retouched before the negatives go for etching and plating.

To overcome this problem, Stavid's lab technicians have modified their Robertson Reproduction camera so the copy frame is quickly converted to a translucent glass opening. Instead of lighting the draftsman's circuit layout from the front at a 45° angle, Stavid's men transilluminate it with a 35-amp arc lamp projected through the rear of the translucent opening, producing an image free from reflection. To institute the system, the photographic department got draftsmen to use translucent polyester sheets for circuit layouts.

To further complicate the intricate printed circuit process, Stavid's photo section is required to provide a negative of the component side of a printed circuit board, a positive transparency of the same board's circuit side, and a transparency suitable for silk screening of all the symbols that must go on the board. When the letters are applied in ink by silk screen methods, selective film transparencies are prepared. Two exposures are made of the same view, with the lettering deleted from one piece of film and the pattern deleted from the other piece of film.

The film transparencies are individually inspected for quality and to insure that an accurate reproduction of the master pattern is made.

Dimensionally stable films such as polystyrene or polyester base are used for all printed circuit work.

In its work for the Preliminary Design Department, which is the agency that prepares contract proposals, the crew's main job is to supply technically accurate photographs and various graphic art techniques that convert technical information into attractive, interesting presentations at minimum cost. Some techniques used are halftone screens, combinations of negative and positive strippings and the use of colored diazo overlays.

Written proposals are often accompanied by visual slide presentations either in color or black-and-white—or with color diazo materials that enable colored slides to be made from black-and-white line drawings. The photo unit usually turns out 40 to 60 slides per job.

Training aid slides in color and black-and-white for use in overhead projectors are also produced, as are large colored and black-and white wall charts up to 24 x 36 in. for use by Stavid's field engineers in giving customers instruction.

Much assistance is given to Stavid's Engineering and Manufacturing Divisions. Several copies of each engineering development shot are supplied to the responsible engineer on document-weight paper for inclusion in progress reports, for binding in notebooks and for making notes, comments or revisions right on the illustration.

Many photographs are used by the Manufacturing Division to aid in assembly of equipment. When intricate detail, such as wiring, has to be illustrated, 20 x 24-in. enlargements are made. Photos of this sort have proved to be a time and money saver since they often eliminate the production of complex diagrams by the Drafting Dept.

Technicians also make recordings of wave patterns from electronic oscilloscopes using 35mm and Polaroid Land scope cameras.

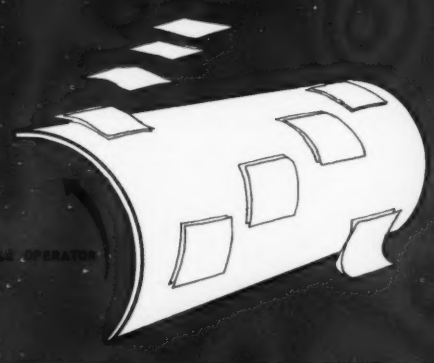
Stavid's photography section furnishes all publicity and advertising photographs for the company's house organ, sales brochures and publicity releases.—THE END

AND
REPRODUCTION

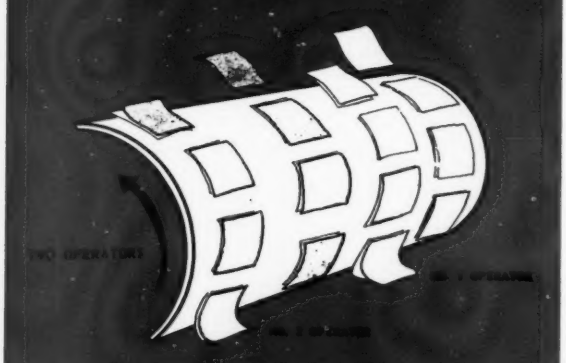
# DIAZO DISHES IT OUT

**Though nearly every reproduction man is faced with the problem of making collated copies of thick and thin stacks of originals not all know that a whiteprinter can make and collate any number of 8½ x 11 copies at almost four times its rated speed. H. P. Maguigan shows how with a few tri cks and no alterations in existing equipment**

Half-blast system requires the services of one operator who grabs original with one hand, diazo paper with the other, sandwiches them and feeds the two into the whiteprinter. Originals go through machine four times, one channel at a time to produce four collated sets of copies of the originals. Then are stacked in order at the side.



Full-blast system takes two operators working side by side to utilize full productivity of the machine. Number of originals is unlimited. A complete cycle by either method produces four sets of copies. When making more than four sets, a plain sheet of colored paper is passed through each channel at the end of its cycle for separation.



Result: Four collated stacks, face up

Many users of large diazo printers are unaware that volumes of 8½ x 11 sheets can be printed and collated in one step with their present equipment.

The original — typed or hand lettered in pencil or black ink on translucent paper, tracing cloth or film — is placed face up on a sheet of diazo paper and both are fed into the machine in the usual manner. The copy is processed and delivered face up in a tray. The original returns to the operator. By feeding the last original of a set first, and following it with the next to the last original, on through the balance of the set — the prints emerge face up in the proper order eliminating a reshuffling job. In order to get a neat stack the operator should be careful to place each subsequent sheet in the same relative position before feeding it into the cylinder. Most machines have guide lines scribed on the feed table to facilitate this.

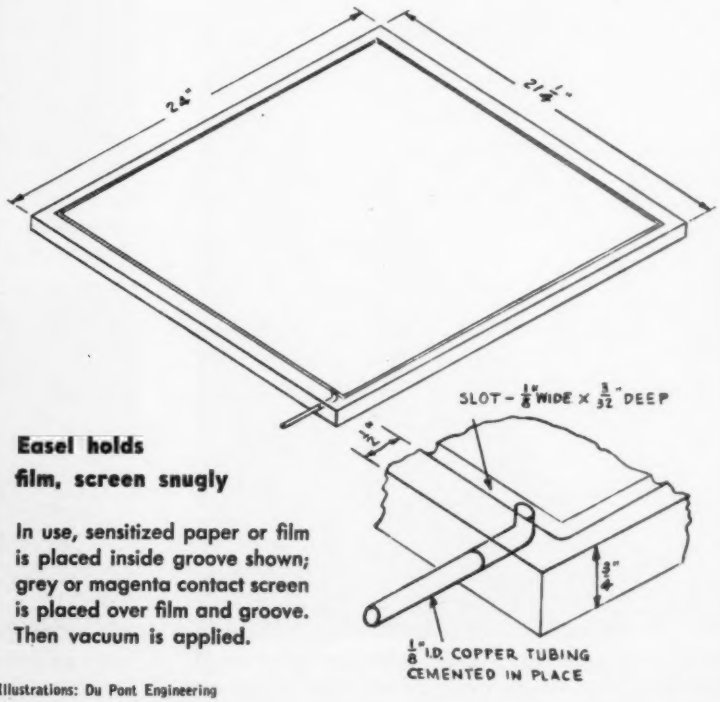
### Many hands, light work

If more than one set is required the operator can feed the machine in such a way as to end up with four neatly collated, face-up stacks of copies from a set of 8½ x 11 originals of unlimited number. To do this, the feed table is marked off into four lanes with white tape. The operator feeds the last sheet of the set into the right hand lane as outlined above. When it returns, she feeds it into the second lane—meanwhile feeding the next to the last original into the right hand lane, and so forth. This is continued until the final original (page 1) is reproduced in the left hand lane. The result is shown above. Few operators can feed as quickly as the machine can reproduce, so two operators standing side-by-side accelerate the process.—THE END

# VACUUM EASEL

## A hunk of ¾-in. plastic and a copper tube make up simple but effective vacuum easel

The vacuum easel shown in the diagram below is a simple piece of equipment most anyone with a fair supply of home workshop tools can make. It has proven to be a highly effective means of sandwiching photo material and a contact screen in uniformly close contact. Its purpose at Du Pont is to make positive screened polyester base film copies of negatives with a 4 x 5 enlarger. The copies later become engineering drawing masters (or phototracings), to be run off on diazo or blueprint machines. Other possible applications are screened prints for one-shot combination line and half-tone paste-ups and, simply, borderless prints. Base is made of a ¾-in. sheet of Lucite acrylic resin with a groove routed out as shown. A hole is drilled ½ in. deep in one corner. Another hole is drilled in from the corner to intersect A vacuum line is connected to the tubing. A 20 in. vacuum is about right for most applications of the easel and can be provided by small pumps available at graphic arts equipment dealers. A simple test for the proper amount of vacuum is to hold the easel vertically while pump is operating. If screen or film slides, more suction is required.




### Easel holds film, screen snugly

In use, sensitized paper or film is placed inside groove shown; grey or magenta contact screen is placed over film and groove. Then vacuum is applied.

Illustrations: Du Pont Engineering

Text: Horace P. Maguigan, Supervisor, Engineering Photographic Reproduction, E. I. du Pont de Nemours & Co.

GRAPHIC ARTS AND REPRODUCTION

**If one is to build a ship nowadays, he'd better have a complete set of plans. If the ship is to be of any size, so will be the plans. In fact, some ship plans are thirty feet long and more. Here's how one U.S. Naval Shipyard slashed engineering drawing repro costs with half-size, but still elongated, strips.**

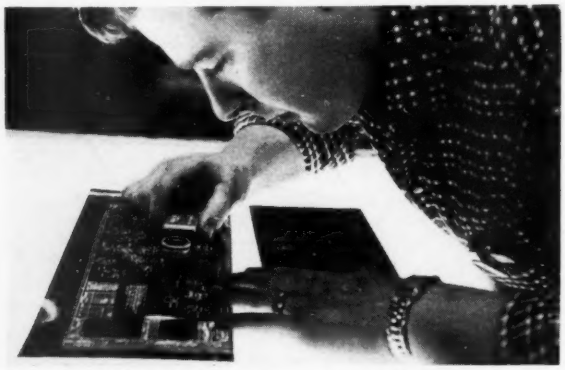
The United States Navy is now planning to add two of a new kind of ship to its fleet, Guided Missile Frigates DLG23 and DLG-24. It happens that both of the ships are basically identical. It also happens that one will be built at the San Francisco Naval Shipyard while the other is to be built at the Puget Sound Naval Shipyard.

As plans stand, the Navy will, instead of purchasing two sets of reproducibles, limit themselves to one set of blueprints. From this single set of prints, half-size duplicates will be made for both shipyards. By this maneuver the Navy expects to save a cool $150,000, according to Martin F. Ahlborn, supervisor of reproduction at the San Francisco Naval Shipyard.

# NAVY COST CUTTING:

**At San Francisco** shipyard, reproduction worker Henry Drews checks ½-size paper copy against original blueprint; ½ reduction cuts workprint material by four.

**First step** in process is to feed blueprint into Neoflow reducing camera, which is capable of operating at speeds of 25 ft. per min. on copy to 42 in. wide in daylight.



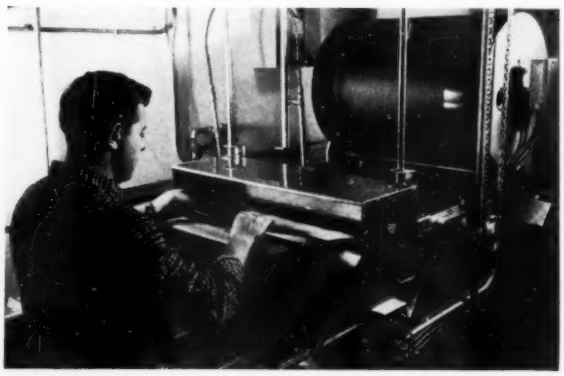
**One-seventh-size** film or paper reproductions may also be made with reducing camera, as well as six other reductions. Here Drews checks for image clarity.

A hundred and fifty thousand dollars is a hundred and fifty thousand dollars, and one might wonder why this measure was not taken before. As a matter of fact the Navy did take the step before, but only after equipment capable of turning out precise half-size reproducibles of naval prints was available. And that has been only recently. The problem with naval prints is that in many cases they must represent a good length of ship in order to make sense. They run, in fact, upwards of 30 ft. It doesn't take much imagination to figure out how unwieldy a process camera would have to be to handle a piece of copy 30 ft. long.

It did take imagination to figure out how compact one could be. Designer and co-inventor of the Neoflow reducing camera, Carroll B. Collins of Pittsburgh, Pa., did figure out how to make one that satisfied the Navy as well as other users of long prints. His 105-in. high present model operates with film or paper, is able to keep up with originals up to 42 in. wide, running at speeds to 25 ft. per min. The camera offers seven reductions from 2:1 to 8:1 by means of gear set mirrors and a pair of 10 and 19-in. Goerz Artar lenses. There are many refinements, and the Neoflow is a pretty elegant solution to the problem. But past Navy experience has brought out some cogent facts in testimony to its practicality.

In 11 months of 1958 about half of the drawings at the San Francisco yard were reduced with the Neoflow before making work prints. (Various reasons prevented the Navy from adopting the system throughout: e.g. fractions lost clarity in subsequent reproduction.) In all, 53,950 sq. ft. of paper negatives were made, and from these came 1,079,000 half-size blueprints. The total cost of these and the folding operations was $36,520 figured at 2¢ per sq. ft. for blues and 20¢ per sq. ft. for paper negatives. Had this been done in the conventional full-size manner, the total cost would have been computed at $94,620. The saving for the initial operation was thus $58,100. Similar installations are reportedly underway at other naval shipyards.—THE END

# DOWN TO SEA IN STRIPS

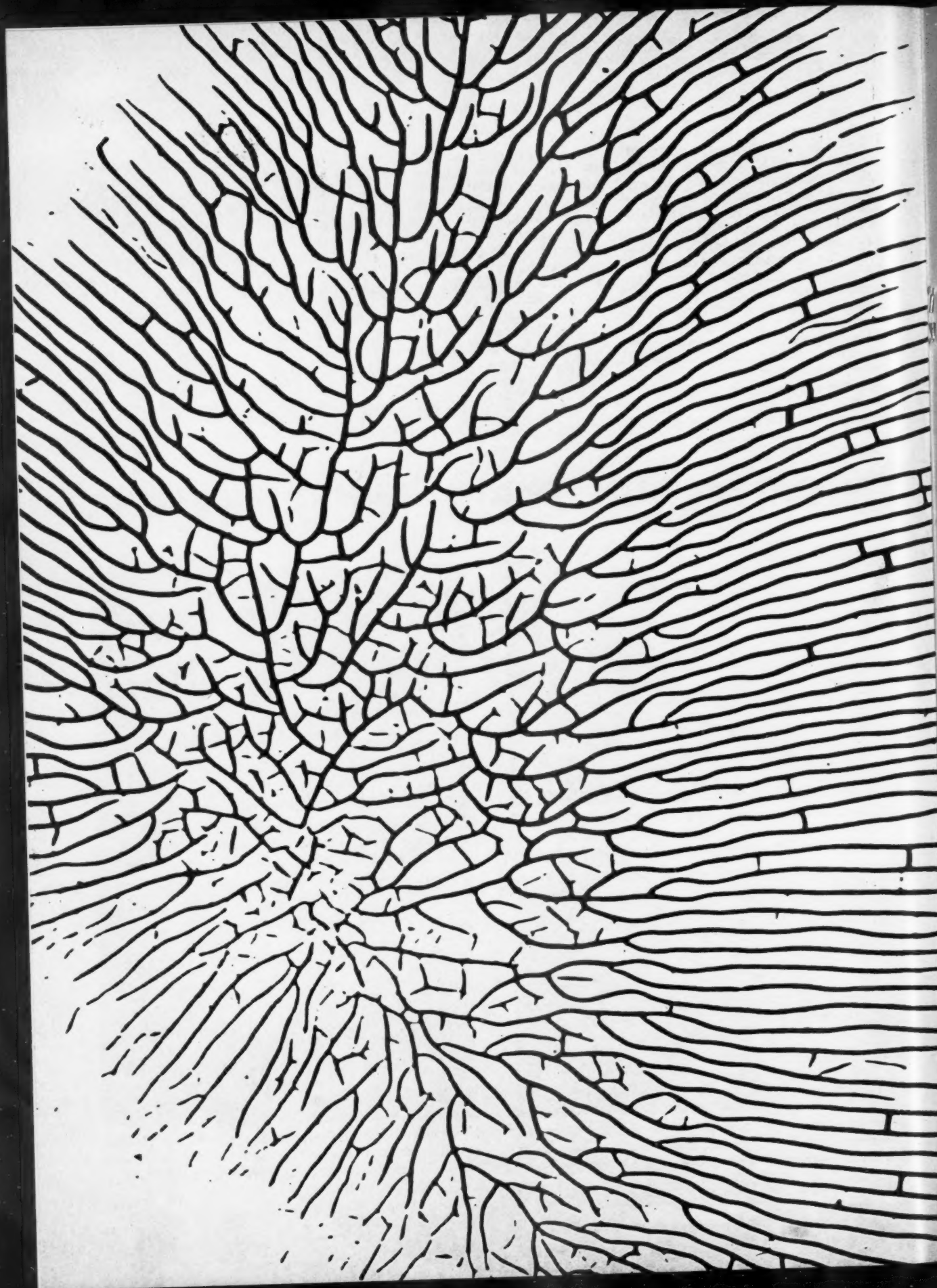


**Magazine** for paper negative material is daylight loading. Here Drews loads it into processor, companion to reducing camera. Processor turns out prints dry in daylight.

**Fed** into diazo machine by operator Helen Ericsson, paper prints are copied after processing and cutting. Either diazos or blueprints are the working drawings.

**For the file,** diazo operator runs 1/7-size strip copies. Peerless Photo Products, Inc., Shoreham, L. I., distributes Neoflow reducing camera, processor and enlarger.

**New addition** to the strip printing operation is Neoflow enlarging camera which utilizes high-intensity reflex projection for continuous strip enlargements 2X to 7X.



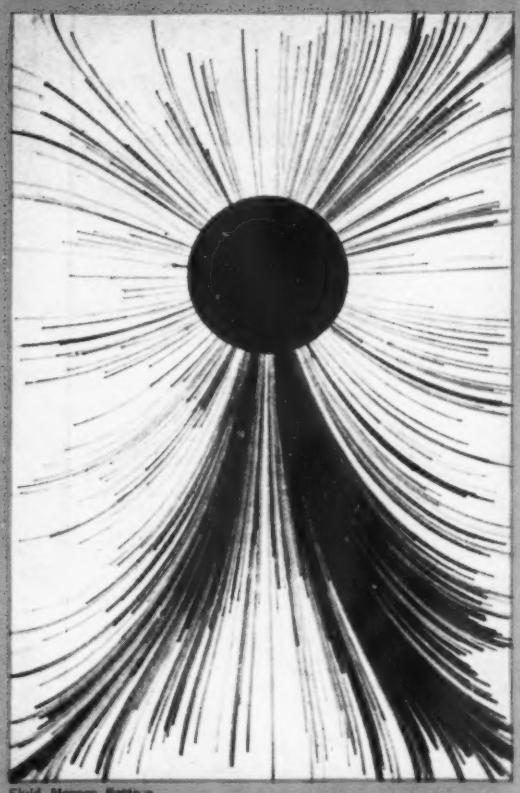
Cracks in Dry Ink

The new landscape is made up of shapes and patterns that were invisible before modern technology revealed some and created others. The new images caused a revolution in vision, which although most apparent to the public in modern art, is seen in science and industry. Examples from all three fields are presented in Gyorgy Kepes' *The New Landscape* (Paul Theobald & Co., Chicago) a symposium on meanings and aspects of this revolution.

Kepes, Professor of Visual Design at MIT, is in the tradition of the Bauhaus, that post-World War I avant-garde design group whose members were the source of much of today's contemporary styling, stripping away the 19th century gingerbread to reveal the basic form and function of an object.

None of the pictures presented here from this book resemble anything people are normally used to seeing. Compared to the traditional picture, these are visual effects with a beauty all their own —in every way a new landscape. Many of these new pictures could not have existed until the development of X-rays, high-speed cameras, stroboscopic lights, specially sensitized emulsions and electronics made it possible to see these new images. The industrial and scientific photographer, in the course of opening new fields of vision, found forms which provided some of the inspiration for much of our modern art.

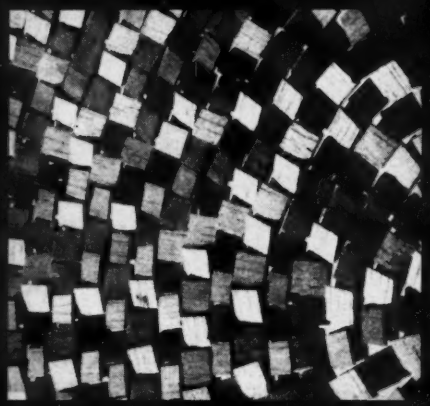
The primary purpose of this book is not merely to show what the new landscape looks like, but to point the way to a possible common ground between the artist and the scientist, both of whom combined to create the new meanings, the new symbols and the new shapes with which we are learning to live.



Fluid Mapper Pattern

Modulation Disk

# PORTFOLIO NO. 16



Extremes of form and shape are found everywhere by the inquisitive lenses of science and industry. Dorothy Pelzer's *Acoustic Roof* (left) duplicates the precise cellular construction of nature, while Roman Vishniac reveals the random sprawling of the *Slime Mold* (below), a scattering which few man-made objects could rival. But as in modern art, the basic appeal is in the visual sensation, not in the object itself. Despite the very practical motivation behind many of these pictures, they remain typical examples of non-objective art, perpetuating the centuries-old question of whether art follows nature or nature follows art.

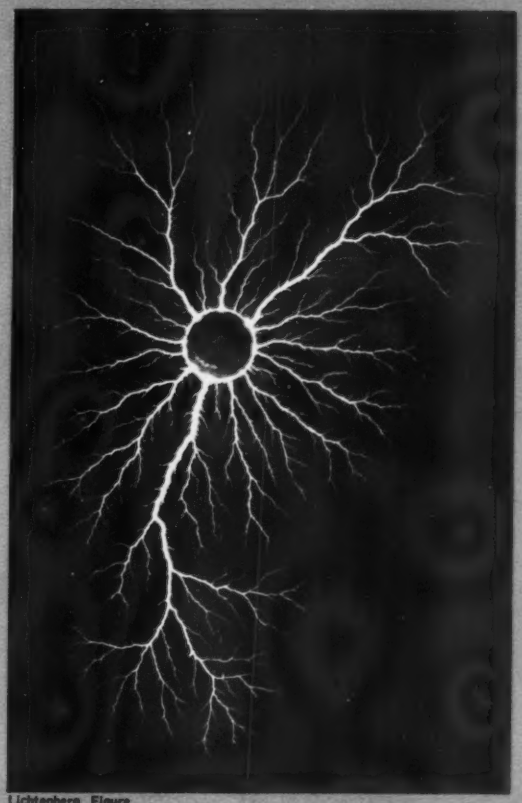
Falling Drops

The pictures here show some of the infinite variety found in this new world. *Cracks on Dry Ink* illustrates the transformation of a surface radiating from the first flaw. To see unseen forces, such as magnetism, a fluid mapper is used, giving the result shown in *Fluid Mapper Pattern* by Michigan's Prof. Moore. *Modulation Disk* shows the variation in intensity in multiwinding spiral bands.

Herbert Matter dropped some ink in water to record the dispersion in *Falling Drops*. Electricity, another formerly unseen force, is the subject of *Lichtenberg Figure*, showing an electric spark, made by Prof. von Hippel of MIT, and *Alternating Current* photographed by Fritz Goro for *Life*.

The derivation of these pictures is as varied as science itself, including both nature and man.

These then, are some of the new subjects and new designs in today's new landscape of art and science.



Lichtenberg Figure

Alternating Current

GRAPHIC ARTS AND REPRODUCTION

# FEAST OR FAMINE

Bill Fouts, Publications Control Officer at the U.S. Army's Signal Supply Agency in Philadelphia, had to figure out a method of turning out thousands of engineering drawings on a short-run, quick-change basis without spending a fortune on copying equipment. His answer: mate a 24-in. Copyflo offset master made from microfilm with a printing press. Now there are piles of reproductions without too much sweat, a cool answer to a feast or famine problem.

Feast or famine is an old cliche but it describes exactly the reproduction problem of Bill Fouts, Publications Control Officer at the U.S. Army's Signal Supply Agency, Philadelphia, which handles the bulk of Signal Corps procurement at a rate of $500,000,000.

His problem was the intermittant need for a great number of drawings in sets of 5 to 85, one set needed for each bidder on an Army contract. How could this need be met quickly and cheaply, keeping within the limited budget.

To begin with, there were the drawings, most of them microfilmed and filed on Filmsort aperture cards. These cards began arriving in Philadelphia early in 1958 with drawings originating in Army Signal Corps labs. In cases where the drawings had not yet been filmed, VanDykes were filed for use in making blueprints.

Fouts felt that there should be a way to use the ability of the Xerox Copyflo machine, a highspeed printer capable of making electrostatic reproductions on a variety of materials, to make offset masters. Using an offset press would combine the ease of Copyflo reproduction with the speed and economy of printing. Some work with the 11-in. Copyflo had been done, but the size of engineering drawings, 8½ x 11 in. to 17 x 22 in. and larger, made the smaller Copyflo machine less practical for these purposes.

First step in the process is making offset masters from microfilmed drawings. Filmsort cards with the microfilm negative are inserted into a 24-in. Xerox Copyflo printer, giving a 17-in. wide master. This offset master is suitable for drawing sizes, "A."-"H."

Most people in the field felt that the physical instability of the paper master (its inability to maintain an exact size of a long press run) plus the possibility of the emulsion peeling from the master, made the use of paper masters inadvisable in printing presses.

However, Fouts' needs were strictly short run, from 1 to 85 copies at the most, 7 to 10 copies generally. He began making tests in May 1958. The three American manufacturers of large offset presses were approached with plans for the proposed modifications and a low bid accepted. The contract for a modified press was awarded in June; tests proved it successful. Fouts believes any similar press thus adapted would work equally well. By December 1958 the operation began being used for all requests of seven copies or more.

The offset masters are then inserted into a press which has been modified to accept the thin (.005 in.) paper masters. The press modification includes a change from the conventional plate clamp to a single bar clamp activated by a lever located on either edge giving fast locking finger tip movement. Changeover time is cut from 15 to 30 min. to about 30 sec., an important time saving considering the short runs needed. The lead clamp was changed to provide for hori-

zontal insertion of the master into the lead plate clamp. Trying to keep a large thin piece of paper straight with one hand can be a very frustrating chore, hence the shift. Once the master is clamped into place the required number of copies are run off at a rate of about 7,500 an hour.

In computing the relative cost of this method as against using blueprint, VanDyke or even Copyflo machines, the make-ready time of the press is a prime consideration. A typical day for Fouts might require printing from 7 to 85 copies of some 400 drawings. If this were to be done on a Copyflo machine printing at 20 ft. per min. or 600 an hour, the required output would need several days of Copyflo time and, of course, many more man-days under blueprint or Diazo processes. The combined Copyflo and press application can handle this work load economically and eliminate days of administrative processing of procurement documents.

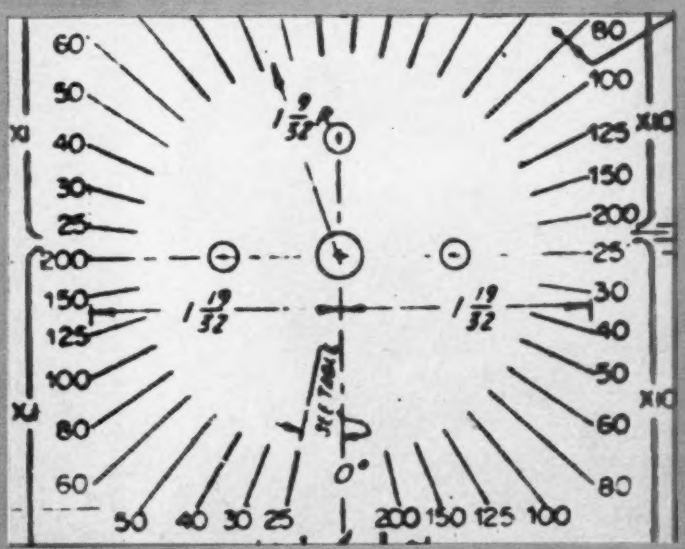
This method is only used on what might be termed "intermediate run" jobs. Where the request calls for one to five copies it may be handled by an Electrofax printer, a diazo machine or on the Copyflo printer. (Diazos are made by using the Copyflo printer to make a transparent master, then using this in an Ozalid or blueprint machine).

In addition to the Copyflo printer there are four 2066 Multiliths, two of which were modified to take straight-edged masters for "A" and "B" drawings. Also present are several smaller sizes making 15 Multilith machines in all. Ozalid and blueprint machines are also available to the 40 people who staff the reproduction branch. The work load for reproduction of engineering drawings alone might require printing 30,000 drawings using 400 mats during an 8-hour day. This comes out to one mat change about every 3½ min. for each of the three presses used in this work, pretty fast in any league.—THE END

The following chart show how the microfilm images of various drawing formats are handled:

| DRAWING | ENLARGED | FINAL COPY |
|---|---|---|
| A—B | 15 X | Full Size |
| C | 15 X | 15/16 |
| D | 20 X | 2/3 |
| E—H | 15 X | Reduced |

The master is placed on the modified press using a horizontal feed. The bar clamp fastens with either of two levers at the side, cutting changeover time to about 30 sec. On some days, as many as 400 mat changes are made during an 8-hour day on the three presses used, one printing press *(above)* plus two modified 2066 Multilith machines. The Multilith machines had to be modified to take the straight-edged offset masters made by the Copyflo printer. This method of reproducing engineering drawings, developed by Fouts for use at the Philadelphia Signal Corps installation, is believed to be the only such method currently in use. For short-run work, it is faster and more economical in time and material cost when compared with other systems.




Section of engineering drawing made by offset from microfilm copy. Smaller "A" and "B" drawings are reproduced full size. "C" size is almost full size (15/16) while larger drawings are reduced.

AND REPRODUCTION

# POLAROID STOCK CONTROL

**Moments** after shooting, photographer John Weber *(left)* delivers a black-and-white transparency of a papier-mache kiosk about to enter NBC TV's prop stockpile to Drafting Department head, Rod Elmore. Grid shows scale.

**Notes and measurements,** taken while the picture was made, are converted into a pencil drawing of the prop on 8½ x 11 tracing paper by Elmore. He then fits transparency into slot cut in drawing, and Scotch tapes it in.

**Copies** of composite drawing and photograph are made quickly on diazo sheets by Mohamed Salem *(left)*, after Elmore has finished his work. Diazo reproduces tone values approximately, details sharply at estimated cost of 2¢.

**A thousand** and more props are in the purview of nine NBC departments, via nine sets of each of the diazo prints, punched to fit notebooks shown. If prop is redone, replacement sheet is made by altering a film diazo copy.

**A simple technique for combining picture-in-a-minute transparencies and line pencil drawings on a diazo print provides NBC television studios in Hollywood a quickly-made, low-cost and positive record of props in nine separate departments of the organization—E. E. Reshovsky**

Keeping track of more than 1,200 props of various sizes and descriptions, as used on sets of television shows, is one of the tasks of Roderick J. Elmore, Head of the Drafting Dept. at the sprawling NBC television studios in Hollywood. These items are nearly all one-of-a-kind and range in variety from circus tents to end tables, from a Chippendale chair to a cafe front.

From the start photography was considered the simplest way of recording the props and for some time each item was photographed on 4 x 5 film, a contact print was made, and this print was then pasted on index cards for filing. In addition, a precise blueprint of the item was filed separately.

Since nine separate departments each needed a ready access to records of all the props, the double inventory system led to varied complications.

Elmore decided to consolidate photographic and drafting records of each prop on a single sheet of paper. The system consists of 1) photographing the prop with Polaroid Land transparency film, 2) splicing the transparency into the tracing paper drawing of the prop, and 3) running off copies of the composite on white print paper.

Elmore made cost records of the old and new systems and discovered that the new one presented cost as well as convenience advantages. For one, Polaroid photography saved 37.5¢ per shot at the outset when compared to conventional photography, when time and overhead for processing were considered, he says. Another 75¢ saving per prop was effected for those nine duplicates, according to Elmore, by running off distribution sets on the Bruning Copyflex machine, already set up in the drafting office.

In addition to the financial saving, the new system is fast. The Polaroid transparencies can be attached to the drawing immediately without waiting for the still photo lab to deliver the prints.

Since about 500 cards had already been filed before Polaroid was decided upon, all the old index cards were copied by John Weber, Graphic Arts Photographer, in order to established a uniform system of indexing.

Whenever there are about 30 new prop units to be inventoried, Elmore and Weber arrange for them to be moved to an outdoor location, where the props are aligned against background grids, which are ruled off in one-ft. squares.

Photographer Weber records each item on a Speed Graphic equipped with a Polaroid adapter back, using Polaroid Projection film type 46-L. Thirty units can be photographed in about three hours. Later, Elmore tapes the resulting transparencies to the working drawing. This "master drawing" is then run through the Bruning Copyflex machine for reproduction on Driazo No. 1005 TL moist process white-print paper, before being filed away in a master file.

When a property is later changed to fit the needs of another program, Elmore has a chance to see it before it is returned to stock. If the changes do not completely obsolete the original photo-drawing, he has a copy of the original made on transparent diazo film. He makes the required additions on this intermediate, and has second generation diazo copies of it run off for the files.

The system provides the fastest and simplest way to keep stock records; says Elmore. "The calculated saving of $1.17½ per set, consisting of one original and nine copies, is considerable," he adds "every so often we also have occasion to run additional copies off the master drawing and these we figure only cost us two cents each."

—THE END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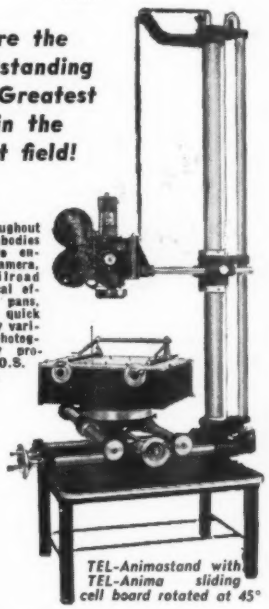

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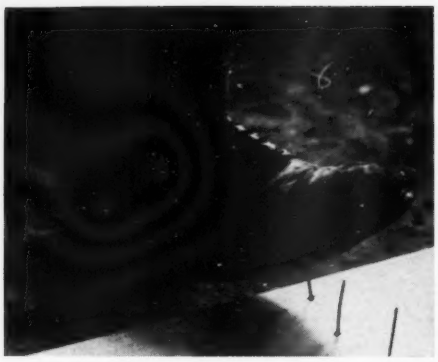
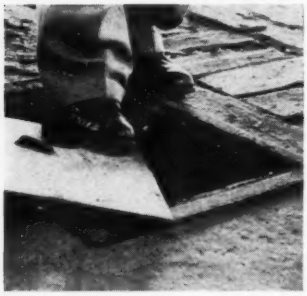
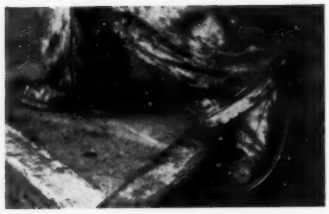


# OUCH!





**Why look where you are going when with a little bit of luck you can step on a nail, trip on a rail or fall down a ladder in this sad but true tale of foolish feet**

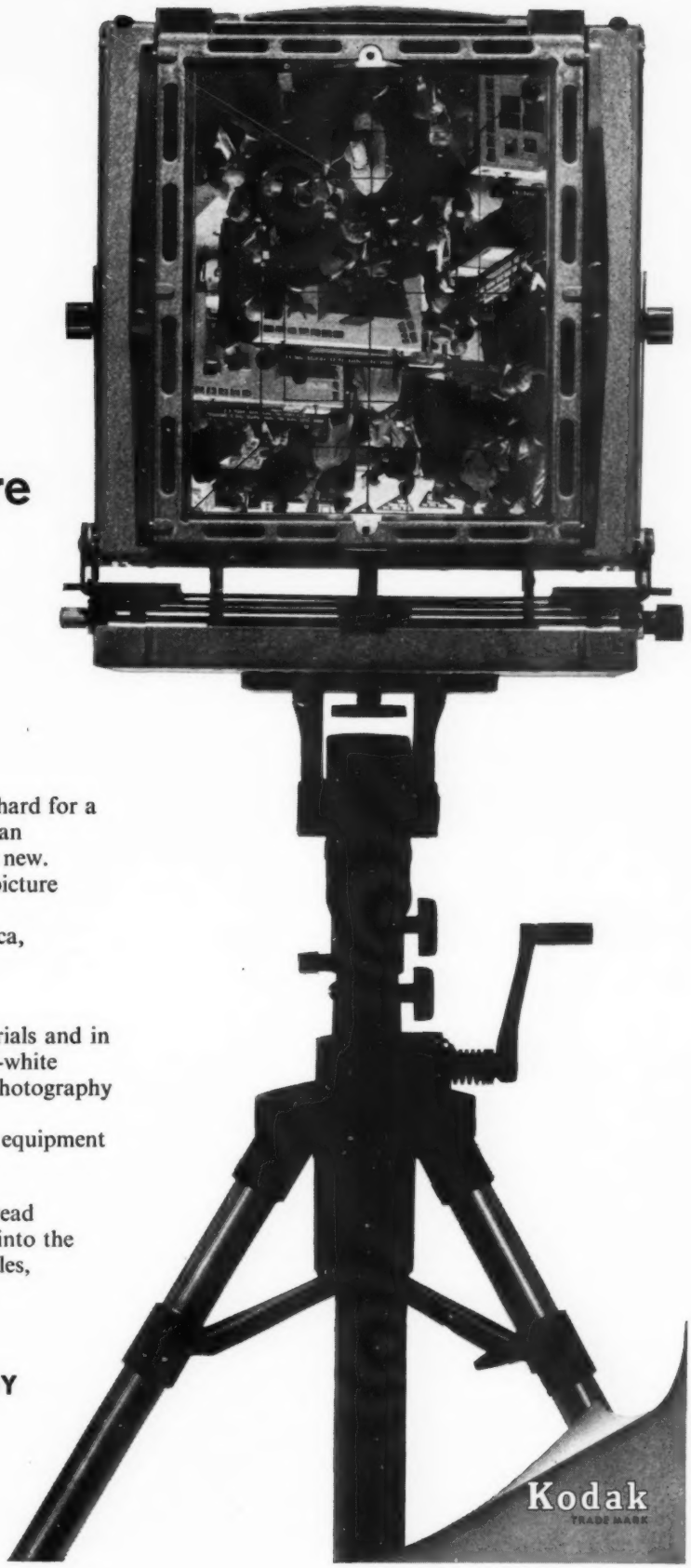
One of the major problems of any large plant is the prevalence of foolish feet belonging to workers who can't seem to look where they are going. Despite posters and lectures and all the fatherly advice a foreman can muster, people always walk where they shouldn't. In an effort to show just what some of the pitfalls are that can befall the unwary, Nora Wilson of Pullman-Standard's house organ *The Carbuilder* made the pictures shown above at a Pullman plant near Chicago.

Walking around the plant, she noted what seemed to be a great many missteps, some of which she photographed by getting careful workers to model for her. Although most plants have safety engineers to eliminate the worst hazards, somehow it is always the little thing that nobody noticed which causes the accidents. In these pictures, for example, all the potential accidents are of such small things; nails in a beam which should have been picked up, failure to simply pick up the feet to pass over obstructions or carelessness in descending a ladder.

The area of safety is one place where very often, a photograph *is* worth the proverbial 1000 words. And as photographs, these are above average for house organs. Too many pictures show the same tired subjects in the same tired poses, killing whatever worth there is in the story by an unattractive hackneyed presentation that screams "lazy editor."

This brings us to the moral of the story, namely, look for the new approach. It is not always easy and it may not always be welcomed with open arms by the more unimaginative types, but in the long run, such a policy will lift house organ pictures out of their old tired rut. And in closing, a word of advice to all hardworking photographers who go through life with eyes glued to the viewfinder: watch your step. . . . Ouch!

# We hope to see you in this picture next month...




So much is new in photography, it's hard for a good man to keep abreast. But you can see what's new. Hear about all that's new. All under one roof, if you're in this picture at the National Convention of the Professional Photographers of America, Los Angeles, Hotel Statler-Hilton next month.

See what's new in transparency materials and in exciting products for both black-and-white and color work in every branch of photography —industrial, commercial, portrait. See, too, how continuous-processing equipment brings automation to photography.

So much! It would take a month to read about it all. Do it the easy way. Get into the picture, *with us*. See you in Los Angeles, at the Eastman Kodak Exhibit. Next month.

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**An old hand at the game, Earl Stanton of Bell Aircraft, Buffalo, N.Y., blasts what he feels is awry in the field with this essay**

# ON P

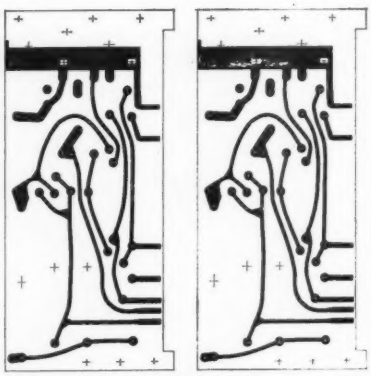
The growth of printed circuits has exceeded the growth of the electronics industry itself in the United States over the past ten years but I am of the opinion that a great deal remains unsolved if the printed circuit is to find itself in full scale use in many types of electrical circuits outside of its current specialty of television, radio, radar and similar lines.

Being relatively new, the subject is controversial in its electronic and photographic aspects. And it is a photographic subject, no matter how viewed. It involves photoengraving, screen process printing, and numerous other facets of photomechanical reproduction, as well as pure photography. Dip into any aspect and you find you've stumbled on a hornet's nest of conflicting opinion. Compelled to start with an explosive subject no matter which I chose, I choose artwork.

As in any photograph good quality subject matter is half the battle. That the subject matter is purely functional—an ugly looking group of wires stiffly spread on a baseboard—does not except it. Here is the beginning of the etched circuit. It should be good.

Some insist in no uncertain terms that black tape will serve the purpose for printed circuit original copy. Others insist the original design should, or must, be India ink on the very best white background available. Having worked with both, I'm inclined toward the latter opinion—the better starting point is India ink, professionally laid down on the best possible white background.

If only a few cheap boards are to be made and expenditure on artwork must be held to a minimum I will concede that the black tape artwork may prove satisfactory. If we are striving for a premium result where close tolerances are required then my experience tells me that the manufacturer saves in several ways by starting with an India inked drawing. For example, I have yet to see a circuit



How original affects line negative quality: ink *(left)* vs. black tape

design made with tape which does not require an opaque work-over before the circuit can successfully be printed down on copper and etched out.

While on the subject of artwork, I want to express strongly the opinion that a premium board should

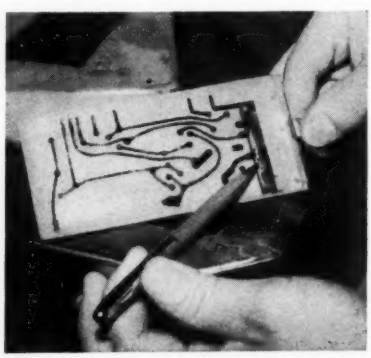
Complicated miniature circuit illustrates advantage of 8X original

be drawn up at least eight times oversize. I know that many makers standardize upon 4X and 2X artwork, but reducing every error eight times when it is shot down to the working size has proved itself to me. I'll stick up for 8X as standard working size.

That brings up another point. Standards widely adopted and carried out would dissipate for good many problems in making photo circuit boards. Let's say that the XYZ Mfg. Co. designs an electronic unit. The artwork is originally drawn to twice size; and perhaps the person in charge feels that black tape does the job. Perhaps it does. But then the unit reaches a point in production where XYZ management feels that an outside vendor should make the boards in production at a production price. Some will accept the twice scale artwork, but many leaders in this specialized field, re-do the artwork according to their specifications. The original effort is wasted, to the detriment of all concerned. Lack of standards creates waste such as this continually.

There is much more to be said on the subject of artwork, but space limitations require me to move on to a few photoengraving aspects of etched board making. Whether a photographic or mechanical acid resist is used on copper, etching is not difficult for the professional photoengraver. It is not difficult, that is, unless a poor quality negative or positive reaches the man who is to print down the circuit design on copper. Again the quality of the finished piece is limited by the quality of the preceding steps. If there were reflections from the tape used for the original, or other density changes in the black tape, or weak areas in the negative there's trouble.

It's pretty sickening to carry through this far in making a copper printed circuit only to have a wire etch away or a terminal point lift from the copper base or to see any other of a number of snafus that are possible when work is substandard anywhere along the chain. And inspection before etching is not necessarily the answer. The pressure is on the operator to try



Failure to keep it clean from original to etchant shows up in end

AND REPRODUCTION

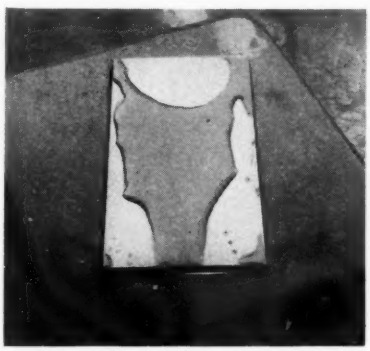
# N PRINTED CIRCUITS

to etch anything that has squeaked through all the steps before coming to him. Quality is not quality unless it is consistent and routine.

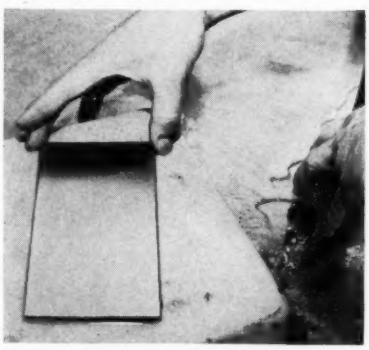
In practice there are three alternatives in preparing a board for photo etching: a resist can be sprayed on a clean copper surface; the resist can be whirled on in the photoengraving tradition or, if only a few boards are produced the copper can be dipped in resist and dried before printing. The last method is slowest but most dependable.

I would say that if production is involved, spraying is probably the most economical medium, next is whirling and third is dipping. But two coats of spray are advisable to cut down rejects.

Above all, the surface *must be clean.* Just one bit of grease or foreign particle present may be on a critical area. When the board is almost completely etched you see the sad spectacle of an unclean surface allowing the resist to leave, whereupon the etchant attacks the copper. If this happens, another board goes to scrap. Costs for the piece are doubled. The lost board is not the only waste. At this point the material is the cheapest part of the whole, much labor has already gone into the making of a board before etching.



Fact that water stands in puddle on copper reveals it is not clean

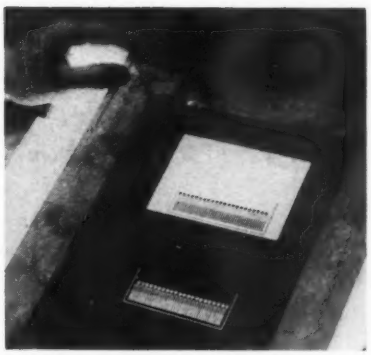


Copper properly prepared for resist will carry unbroken film of water

Etching copper – or any metal – is a chore for highly skilled craftsmen. Professionals spend several years as apprentices before becoming skilled etchers–but I have seen self-styled experts sprout up overnight in industry. This hurts printed circuit making in industry. Once burned a manufacturer is twice wary.

Returning to the etchant, despite the multitude of trade names, two etchants are commonly used today: ferric chloride and ammonium persulfate. The latter is being used quite successfully in still etching as well as machine etching. To my mind the two are equal as etchants, but perhaps the persulfate is too new for any final statements on it. It is, however, worthy of investigation by anyone involved in printed circuits. It does not present the disposal problem normally encountered with ferric chloride. Ferric chloride, which has been used with success for years, must be handled with respect. Special measures should be set up to sewer expended ferric chloride, or some months later the metallic sewers will be peppered with pinholes from the plant to the main sewer. Anyone new in circuit making or about to try his hand should carefully explore the sewerage of ferric chloride if this is the chosen etchant. It is insidious because problems don't show up for months. Ferric chloride damage may be no small thing.

I have seen many excellent boards made with resist, and as many excellent ones made with screen imprinted circuit designs. I think the number of boards involved must determine whether the design is to be stencil screen printed or if the board is to be coated with resist or engraver's enamel and photo printed. I am the first to agree that screen printing is an art in itself and requires mastery before putting it to use in production of printed circuits.



A well-made screen stencil ready to print intricate circuit board

Twelve-position switch is typical work for photo resist technique

The best screen to use in my opinion is stainless steel wire available in ultra fine mesh–as fine as 300 and 400 wires to the inch. Most of the major screen process manufacturers make and market an acid resist type of paint suitable for screen imprinted printed circuit boards. I do feel that a person start-

(*continued on page 67*)

## PMI's Monthly

# READERS' SHOWCASE

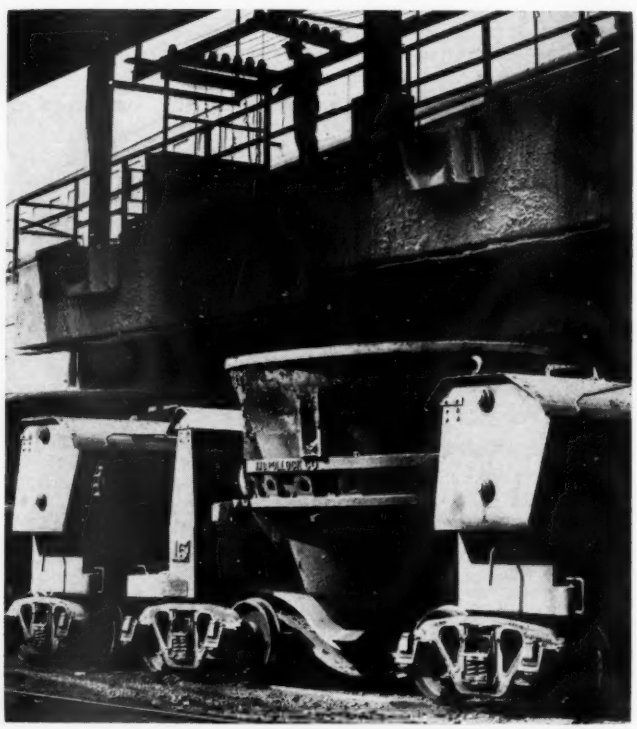
### PMI's readers supply solutions to industrial photo problems

Checking back on past Showcases we see that we have published two pictures of the same subject taken at about the same time by two different photographers. Both in our opinion are excellent pictures and both are worthy of publication. But the coincidence brings up a point. We are receiving more pictures that are more and more alike. On the whole they present an image of American industry that is stern, strong, massive and precise. The uniformity of viewpoint may simply reflect the truth, or there may be another influence. We are beginning to suspect that some pictures are entered on the theory that the only kind of picture PMI wants in Showcase is the kind that we have used. Actually, we're interested in a variety of industrial work: micrographs, macrographs, portraits, stress studies, anything a photographer in industry might do. Don't try to read our minds; show us the picture *you* are proud of, whatever the subject matter. And don't be hesitant. You have a good chance of being published.

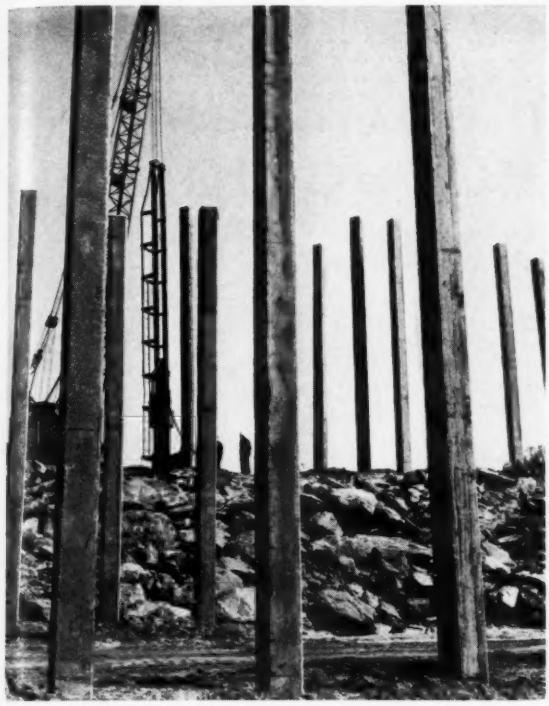
**You are invited to send in your pictures for this feature. Here are the details.**

There are two rewards for each of the pictures chosen. The first is knowing that your picture will be seen by appreciative fellow professionals. The second is $10. Please include your name and your company's name, a note about the picture and how it was used, with the technical data—paste the information on the back of each picture. Send pictures to SHOWCASE, PMI, 33 W. 60 St., New York 23, New York.

**HARRY V. LEIDA,** East Stroudsburg, Pa., commercial photographer skillfully placed two No. 5 bulbs behind a large bedsheet to illuminate a worker's hands holding a micrometer. Display print was made for conference room of the Line Material Industries, McGraw Edison Co. Graphic View II, Super Pancro-Press.



**STAN ROSOL,** Ford Motor Co. photographer, stopped to make this picture, "just before the slag pour," while covering another assignment. Figure entered scene while he was readying to shoot. 4 x 5 Graphic on tripod, pan film exposed 1/25 sec. at f/16, 8½-in. Kodak Ektar lens. Developed in D-76.



**W. C. VANDERWERTH,** Norman, Okla. freelance was intrigued by the standing concrete pilings "waiting for the hammer," while on an assignment for a manufacturer of heavy road equipment. Rolleiflex camera, Verichrome Pan film, 1/100 sec. at f/22.

**JOSEPH FARKAS,** Ford Motor Co., Dearborn, Mich., utilized ambient light in a Ford tool and die building for this picture of a large screw being machined. 4 x 5 Graphic on tripod, Royal Pan film exposed for 1 sec. at f/11, 127mm Kodak Ektar lens.

**CHARLES TERNES,** GM Photographic, Detroit, Mich., made this existing light study of a welder in a GM plant as part of a rotogravure story on Michigan workers. Nikon S-2 camera with 50mm Nikkor f/1.4 lens, Improved Plus-X film, exposed for 1/30 sec. at f/3.5, developed in D-76.

FLAT

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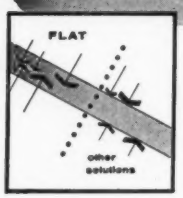


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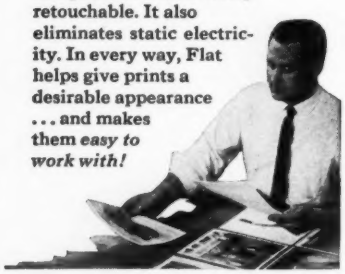

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by Herbert P. Paschel

# REPRODUCTION & GRAPHIC ARTS

## How to wrong rights with photoreproduction and optical systems

In most processes where the secondary image is exposed by contact printing, it is desirable if not necessary to have the primary image in intimate contact with the sensitive emulsion during exposure. This would apply to contact prints on paper, to negative-working lithographic plates, to template work and to any other process requiring a correct-reading positive image.

There are any number of applications which require that the secondary image be wrong-reading; a letterpress printing plate (photo-engraving) is one such example. A regular negative would have to be used emulsion side up to obtain proper image orientation in such cases. But this would prevent intimate contact between image and plate because of the separation imposed by the film base. However slight, such separation could result in image distortion and possible change in size.

With positive-working lithographic plates the same sort of problem exists. A positive made by contact from a regular negative would be wrong-reading when placed emulsion down on the lithographic plate. To obtain proper orientation it would be necessary to use the positive emulsion side up in exposing the plate or, in exposing the positive initially, the film side of the negative would have to be in contact with the positive emulsion. Both possibilities introduce a separation between image and sensitive layer.

A lateral reversal of the primary image can be obtained by using a prism in combination with the camera lens. The optically reversed negative could then be used in photoengraving, in lithography for making a properly oriented contact positive, and for any other system requiring a wrong-reading contact image as the end product.

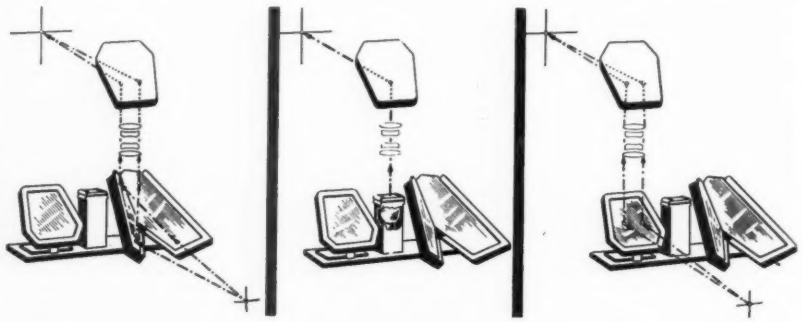
## Use of prisms limited

Unfortunately, prisms cannot be used with conventional straight-line process cameras of the darkroom type since the copyboard must be at right-angles to the lens. Although darkroom cameras are available with the copyboard rails built at right angles to the camera bed in both horizontal and vertical models, such cameras will produce laterally reversed images only.

When the photographic operations (from reflection copy) require both types of images, i.e., conventional and laterally reversed, the following survey outlines a few possibilities.

1: Use of a gallery camera which, because the camera proper is on a

(*continued on page* 52)



Klimsch Double Reversing Mirror System: Left, split plus flat mirror laterally reverse image; *center*, position for flash exposure; *right*, two plane mirrors give normal lens image. Image size is unchanged throughout

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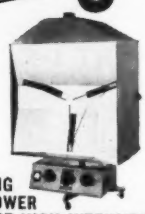

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## GRAPHIC ARTS

(*continued from page* 50)

turnable, permits positioning the camera either at right angles to the copyboard or straight in-line. A prism is attached to the lens for the right angle set-up, the lens alone is used for the in-line position.

2: Use of a horizontal in-line process camera equipped with a multiple mirror reversing system. Such systems provide both normal and reversed images merely by changing from one mirror system to another.

3: Contact printing, emulsion to emulsion, using chemical reversal or auto-positive materials to obtain laterally reversed negatives from negatives; positives from positives. This procedure can be used in conjunction with conventional, lens-only cameras as well as with right angle, lens-prism cameras. In the former case the secondary contacts will be wrong-reading; the latter, correct-reading.

Along with the obvious advantages of each method, a number of disadvantages must likewise be mentioned.

The gallery camera, which offers double utility from one piece of equipment, has a removeable plate-holder that must be transported back and forth between camera and darkroom. In large camera sizes this could prove to be a two man job.

Since the multiple mirror systems displace the optical axis, cameras so equipped not only require special lensboard arrangements, but have special copyboards that are either fixed in an off-center position or can be shifted vertically or horizontally. Because of these special requirements, it is generally impossible, or impractical, to install such reversing systems on existing equipment. Because of the complexity of the multiple mirror reversing systems, only the lens built into the unit can be used. This precludes interchanging lenses of varying focal lengths and thus limits the enlargement and reduction range of the camera to that obtainable with the one lens. The only exception to the above would be the type of camera that also permits shooting straight through a separate lens.

The chief objection to reversal by chemical means or the use of auto-positive materials is doubled costs.

Which of the methods discussed will satisfy a particular problem best cannot, of course, be resolved here. The occasional need, obviously, would not justify investing in rather expensive equipment. But if this is an everyday problem, the information presented could prove helpful in arriving at a solution.—THE END

by Samuel Lang & Leonard Zoref

# INDUSTRIAL COLOR

**If inconsistency is your hobgoblin, check your printing filter density**

Many times, color and density shifts are blamed, unjustly, on the paper. Actually, the fault may be in the improper use of color printing filters. It is absolutely necessary that each printer set up a system for himself for selecting filters to be used in arriving at a given color balance.

If your filter pack requires a CC70 filter you cannot use a 40 plus 30 one time and a 50 plus 20 another time and hope to get consistent results. The filters are not manufactured that accurately and unless you are careful you will get a definite shift in density and color. It can be exasperating to have a print of given color balance and make a change only to get results that are not even close to what was expected, due to the variability of filters.

Here is a hypothetical example. The filter pack consisted of a 70 magenta plus a 60 yellow. Our evaluation of the print indicated a change, removing 05R (05M plus 05Y) from the pack. The original filter pack was made up of a 40 plus 30 magenta and a 40 plus 20 yellow. The new pack consisted of a 40 plus 20 plus 05 magenta (65M) and a 50 plus 05 yellow (55Y). The results with the new pack did not approach what we normally expected, and after this had happened a few times we made densitometric readings of our filters. We read each filter through its complement in the sharp-cutting series filter. After discounting the density of the filter base which, for purposes of this discussion, we will assume to be .03, our readings might be as follows. (These

| Mfgr. Rating | .025 | .05 | .10 | .20 | .30 | .40 | .50 |
|---|---|---|---|---|---|---|---|
| Density | .04 | .07 | .11 | .23 | .32 | .46 | .54 |

figures are not actual readings, but indicate the type of variation found.) (Incidentally, we found very little difference between Eastman and Ansco filters and we use them interchangeably.)

To see what this means in practice, consider our first print. From our readings, we see that the actual density of the first filter pack was 78M plus 69Y instead of the marked 70M and 60Y. The second pack should have been a 65M and 55Y; instead it was 76M and 61Y. Thus, instead of removing 05M and 05Y we really removed only about 08 yellow and practically no magenta.

In this case, the proper pack would have been 40M plus 20M plus 025M (giving an effective density of 73M) and a 50Y plus 10Y (for an effective density of 65Y).

The practical approach is to make a chart listing your filter combinations as they actually are, not as they are marked.

**Quick, Henry, the filter**

While on the subject of filters, for a long time there was a need for a quick, practical method for introducing filters into the enlarger lamphouse. Most enlargers have provisions for filter holders but this is a slow process, especially when you want several different tests from given negatives. Agfa and Aristo have made color heads available for quite a while. Recent additions to the market are the units put out by Lektra, for either Omega or Beseler enlargers. It is mounted without disturbing the optical system. The unit contains eight color printing foils, giving a range from 0 to 75CC in 5CC steps, mounted in metal frames which pivot in above the condensers filtering the light source. Four magenta filters pivot from one side, four yellows from the other. Advantages are that the filters remain clean, production is increased and the results can be accurately repeated, provided, of course, that other variables remain constant. On Beseler enlargers a bulb extension has to be used in order to retain even illumination because the bulb is raised an additional inch

(*continued on page 68*)


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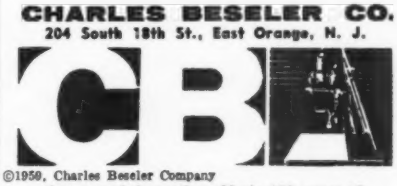


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by Vernon D. Tate

# MICROREPRODUCTION

## Convention report: century's microreproduction in microcosm

On April 2, 3 and 4 the National Microfilm Association held its 1959 Annual Meeting and Convention at the Mayflower Hotel in Washington, D. C. More than ever it was the high point of the year for all interested in microdocumentary reproduction. Well over a thousand people from all parts of the country and some from abroad viewed the exhibits and listened to an exceedingly well rounded program of technical papers, panel sessions and discussions.

The theme of the Convention, "A Centennial of Microfilm Progress," was based on the fact that on June 21, 1859 the first commercial microfilm patent was issued in France to René Prudent Patrice Dagron; a facsimile of this patent was on view together with much historical early material. An original Dagron microfilm camera (especially imported from France by diplomatic pouch), "siege of Paris" pigeon post microfilms, early examples of the work of Dancer, Fiske optical viewers and reduced scale printing, "microscopic novelties" old and new, the original "Teledex" and a large quantity of other material and equipment.

## Program papers

The historical theme was followed to some extent in the program. A paper was read by Mr. Frederic Luther "One Hundred Years of Microfilm Technology." This was based in part on his new book *Microfilm: a History*, 1839-1900, which was first shown at the meeting. Other program highlights included "Diversified Services of the Microfilm Laboratory," "The Uses of Microfilm in Other Countries," "The Design of Forms for Microreproduction," Microfilming at the County and the Federal Level (2 papers), three papers and a panel discussion on filming engineering drawings, "The Use of Microfilm in a Map Reproduction System" and a carefully detailed technical presentation "Special Transmittance of Microfilm as Related to the Quality of Electrostatic Prints." In a provocative and interesting paper Peter Scott of MIT called for and proposed a program to execute increased basic research in microphotography.

In all there were 26 papers. The complete texts of these together with some additional material are being printed as the *Proceedings* of the 8th Annual Meeting. This volume will be available for participants and members in early June; a small over-run will be available for purchase by others.

## Varied exhibits

The exhibits required the combined facilities of the State and East rooms so that some 32 exhibitors could display a wide range of products in 50 booths. In addition to conventional and specialized microfilm cameras, reading machines, enlargers, processing machines, viewers, Xerox Copyflow and in fact every variety of equipment, numberless new and useful accessories were available for examination. Several reading machines with build-in facilities for the production of paper prints were observed. Micro-opaques were not neglected and one of these of particular interest was a reading console incorporating Leitz optics made up for Bell Laboratories to use microprinted facsimiles of telephone directories. The instrument was designed around the requirements of telephone operators and though compact was not small; page and item location were easy and rapid. The reflected image on the reading screen was of excellent quality. Another item of reading equipment rarely seen in this country was the Waterworth reading machine made in Australia which may be used with roll, sheet (microfiche) or strip microfilm as well as with microcards, microprint, Microlex or any variant micro-opaque process.

Each registrant received a copy of the new *Guide to Microreproduction Equipment* edited by Hubbard

W. Ballou of Columbia University. Published by NMA under the terms of a grant of funds received from the Council on Library Resources, Inc., the well illustrated volume of 438 pages contains factual and comparable data about microreproduction equipment currently available in the United States with prices as of the date of publication. The entire first edition of 1000 copies was quickly exhausted. A reprint is under way and is expected to be ready in June, when it may be purchased from the Association.

One of the features of the Annual Meetings has been the presentation of the NMA Award of Merit. The first of a series of "Pioneer Medals" designed to commemorate early achievements in the field were awarded. The first of these was given posthumously to John Benjamin Dancer of Manchester, England, (1812-1887) who is credited with making the first documentary microphotograph. The second medal, also awarded posthumously, went to René Prudent Patrice Dagron of Paris, France, (1819-1900) who is the father of commercial microphotographic reproduction. The third medal was presented to Dr. Amandus Johnson, Emeritus Director of the American Swedish Historical Museum of Philadelphia who was present in person to receive it. A living pioneer, Dr. Johnson prior to World War I designed and constructed microfilm cameras for the reproduction of historical manuscripts in the principal archives and libraries of Europe. The fourth and last medal was awarded to Watson Davis of Science Service, Washington, D.C. who was also present, in recognition of his work in pioneering and stimulating the use of microphotography in the service of science through the Bibliofilm Service, the American Documentation Institute and the Auxiliary Publication Service. Through the latter, texts of scientific importance which could not otherwise be published are available.

Far more was available than any single person could fully comprehend. The scope of operations, the kinds of equipment, the diversity of problems and of solutions, the variety of applications illustrate the vitality and growing importance of the entire field. Manufacturers of equipment and supplies, service companies, engineers, technicians, designers, government officials, librarians, archivists, business men, executives and users all met on a common ground for the discussion of common problems.—THE END


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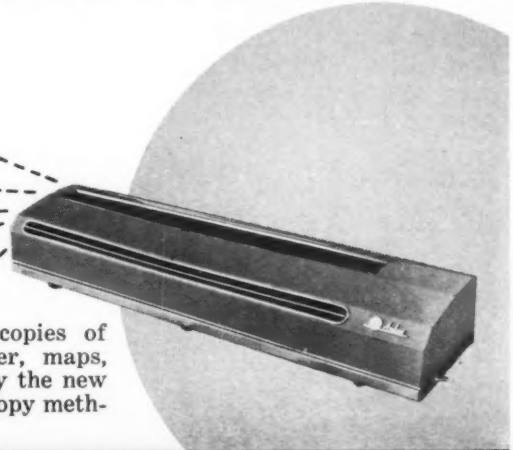

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by Ernest E. Reshovsky

# PHOTO INSTRUMENTATION

**Photography in nuclear research: tri-stereo view of bubble dance**

If a nuclear particle is sent through a bath of superheated liquid hydrogen, it leaves a stream of hydrogen gas bubbles in its wake. By studying this stream of bubbles, scientists are able to identify and learn much about the nuclear particles.

The world's largest bubble chamber has been put into operation at the University of California's Lawrence Radiation Laboratory in Berkeley. It employs specially designed lighting and photographic equipment to obtain tri-stereo photographs of bubble tracks.

The 72-in. Hydrogen Bubble Chamber is unique not only by virtue of its size but also in that only one chamber window is used—a design which has operational, safety and economic advantages over the conventional two-window design.

Mr. Duane Norgren of the LRL Mechanical Engineering Dept., which provided the special lighting and photographic equipment, told us that the ability to operate through one window was contingent upon the creation of a new system of lighting, involving a reflector at the bottom of the chamber, which appears black to the tri-stereo camera, yet be efficient in retro-reflecting light back to its source.

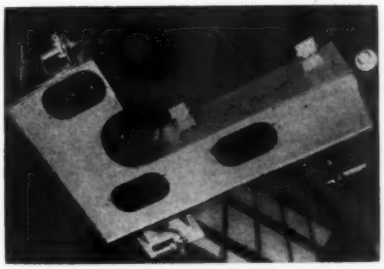
**Cast optical window**

The optical window measures 75 x 24 in. and is 5 in. thick, which makes it the largest optical window ever cast. It was made by Schott Glass Works in Germany. The window is sealed by means of a helium-filled inflatable steel gasket. Special precautions are taken because the glass is operated at temperatures as low as 23°K (–420° F).

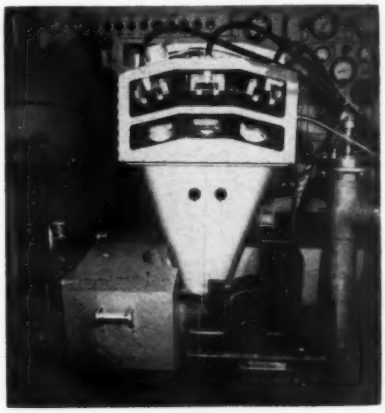
Three high intensity flashtubes, especially made by Edgerton, Germeshausen & Grier, are enclosed in a nitrogen-pressurized housing to reduce explosion hazard. They operate on 2,500 KW for ½ millisecond. They are focused through three sets of Lucite f/0.4 double condensers on a 1 x 4-in. window in the vacuum tank. The reflecting surface itself, situated at the bottom of the chamber, consists of 111 curved plastic reflectors, each 22 in. long, installed so that the center of curvature of each is at the small light source window aperture. The reflectors are coated with optical black lacquer, except on their elliptical reflecting surfaces, which consist of ⅛-in. wide aluminized bands centered about the first (refracting) surface. Since the tri-stereo camera photographs through apertures located concentrically around the central light window, the light scattered by bubbles in the chamber is recorded against a black background.

The tri-stereo camera, which measures 46 x 40 x 12-in., was also engineered by the LRL Mechanical En-

(*continued on page* 58)



**Tri-stereo camera being lowered into *(above)* and in *(below)* its place**



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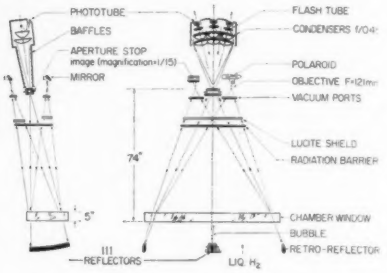
gineering Dept. It is equipped with three 120mm f/8 wide-angle lenses (Schneider Super-Angulons) operating without shutters at f/22. The images are reflected through 45° mirrors to the film, which is transported vertically above the horizontally mounted lenses. The three objectives are spaced 20 in. apart in a triangle. This permits determination of the spatial position of any bubble track regardless of its direction. There is




**Schematic of bubble-chasing optics**

also a fourth lens in the camera, a 4-in., equipped with a simple shutter, to record data of the control panel through a prism.

All gates and platens in the camera are one-side open, to simplify loading. No moving parts are employed in the vacuum platens, and they are equipped with vacuum failure alarms. Guide rollers, with one fixed roller flange and one spring-loaded floating flange, reduce film wander to a minimum. The film magazines, equipped with an out-of-film alarm device hold 1000 ft. of film which is advanced through the camera 16½ in. per camera pulse.

The camera motors and the vacuum valve are magnetically shielded since they operate in a magnetic field of 800 gauss. All electrical devices are hermetically sealed or explosion-proof. Dry compressed air is directed past the lenses against the cold viewports to prevent condensation.

In addition to the tri-stereo camera, a Polaroid camera is mounted on a visual inspection port of the bubble chamber and besides recording experiments is also equipped with its own data input system, which shows time, reel and frame numbers of the tri-stereo camera views.

### Instrumentation convention

"Requirements of Space Age Technology" will be the theme for the annual Convention of the Society of Photographic Instrumentation Engineers to be held in the Los Angeles Ambassador Hotel, August 4, 5, 6.

# FREE LITERATURE

**For your copy of any free literature item, circle the appropriate number on the readers' service card, attached, page 61.**

## AUDIO-VISUAL

**Self-contained Projector** **201**
Bebell & Bebell Color Laboratories. Specification sheet and price list for 35mm Tel-A-Story self-contained rear-projection viewers.

**Film Bibliography** **202**
Victor Animatograph Corp. Bibliography "Where to Get Films and Film Information" lists directories, magazines and periodicals.

**A-V Books** **203**
Hastings House, Publishers. Price sheet lists 15 titles related to the communication arts.

**Automatic Slide Projection** **204**
Spindler and Sauppe. Descriptive specification sheet of Model 300 35mm Selectroslide automatic slide projector.

**Moving Coil Microphones** **205**
Camera Equipment Co., Inc. Specification sheet for D-36 and D-45 moving coil microphones with selector unit. Includes prices.

**Kodak Film**
Eastman Kodak Co. 19-min. film "Pictures Teach at Penfield" outlines role of audio-visual materials in today's elementary and secondary education. Send requests on company letterhead.

## CAMERA & LENS

**Equipment Catalog** **215**
Hollywood Camera Co. 32-page catalog of cameras, lenses, accessories, etc.

**Optical Products** **235**
Bausch & Lomb Optical Co. 24-page booklet indexes over 75 catalogs in the Bausch & Lomb line.

**Datapulse Camera** **211**
Traid Corp. Specification sheet describes the 35mm CineGrafic CE-260 DATAPULSE camera with pulse rates up to 24 frames per second.

**Multidata Camera** **212**
Flight Research Inc. Illustrated specification sheet for 35mm Model IV-E Multidata camera which records supporting and supplementary data directly on each film frame.

**35mm Photo Recorder** **208**
L-W Photo Products Co. 4-page descriptive folder gives specifications of remote-control Northridge RZ 35mm camera for use in aircraft, missiles etc.

**Dynafax Camera** **218**
Beckman & Whitley Inc. 5 pages of specifications describe the operation of the 35mm Dynafax Continuous Writing Camera for motion analysis.

## EQUIPMENT

**QuantaLog Photometer** **214**
Macbeth Instrument Corp. Specification sheet with prices for QuantaLog photo-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meter and attachments for use as a transmission densitometer or reflection densitometer.

**Silver Reclaimers** **213**
Manning-Webb Electric. 4-page folder describes Hypo Silver Reclaimers for acid and non-acid solutions. Includes prices.

**Lighting Equipment** **216**
Mole-Richardson Co. 44-page illustrated catalog and separate price list of specialized lighting equipment for motion picture, still and TV studios.

**Enlarging Camera** **217**
Durst Inc. Illustrated fold-out sheet describes Durst 609 (35mm to 2¼ x 3¼ in.) enlarger, copying camera and slide projector.

**Plan File** **219**
Plan Hold Corp. 12-page catalog with prices of vertical and roll filing equipment for plans, drawings, plates, negatives, etc.

**Dry Mounting System** **220**
Seal, Inc. 24-page illustrated booklet with prices describes complete line of dry mounting materials.

**Borderless Easel** **244**
Clarke Co. 6-page folder describes the Clarke Borderless Photo Easel which holds enlarging paper in place by means of rubber pegs.

**Color Enlarging Meter** **245**
Lester C. Hehn Engineering. Catalog sheet describes the Photo-Design color enlarging meter.

**Elevator Tripods** **246**
Quick-Set, Inc. 4-page folder gives specifications of three Whitehall Travelite elevator tripods.

## MOTION PICTURES

**Equipment Catalog**
S.O.S. Cinema Supply Corp. 176-page illustrated catalog of motion picture and TV production equipment. This $2 catalog will be sent free of charge if requested on company letterhead.

**Rental Price List** **226**
Camera Mart. 16-page rental price list of motion picture equipment includes cameras, accessories, editing and lighting equipment.

**Editing-Lighting Catalog** **227**
Television Equipment Co. 72-page catalog of cameras, film editing, lighting and storage equipment. Includes prices.

**Finders and Focusers** **209**
Photo Research Corp. 8-page folder describes Spectra monocular view finders and focusers for motion picture cameras.

**Underwater Camera Housing** **247**
Sampson Hall Co. 4-page folder and reprint lists five underwater housing units for motion picture and television cameras. Includes prices.

## GRAPHIC ARTS

**Films and Plates** **222**
Gevaert Co. 8-page pamphlet describes specifications and characteristics of Gevaert films and plates for making halftone negatives and positives.

**Photo Lettering** **223**
Mergenthaler Linotype Co. Fold-out circular describes ProType machine for setting type photographically.

**Photo Copying** **224**
Hunter Photo Copyist, Inc. 8-page folder describes Hunter Photocopyist machines, papers and supplies.

## SERVICES

**Color Service** **228**
TriColor Laboratories, Hollywood, Calif. Price list of color developing, printing and duplicating services.

**Color Service Catalog** **229**
Kurshan & Lang Color Service, Inc., New York City, 16-page color data handbook and catalog of services offered. Includes prices.

**Color Lab Prices** **230**
Byers Color Laboratory, Inc. Price list of color services offered by this Oregon firm.

**Color Services** **231**
Meisel Photochrome Corp. Fold-out price list of positive and negative color services from this Texas lab.

**Photo Lab Catalog** **232**
Weiman & Lester, New York City. 28-page price schedule for black-and-white and color processing services.

**For your copy of any free literature item, circle the appropriate number on the readers' service card, opposite.**

## SUPPLIES

**Ilford Microphen** **236**
Ilford Ltd. Descriptive specifications sheet discusses the advantages of Microphen film developer.

**Promicrol Data** **237**
George Murphy, Inc. 40-page data booklet devoted to "fine-grain development" with Promicrol developer. Includes charts, graphs and tables.

**Photo Books** **238**
Macmillan Co. Descriptive price list "Books on Photography." Includes 11 titles.

**Photo Book Catalog** **240**
Amphoto. 26-page catalog of photographic books includes subject and title cross-index.

**X-ray Supplies** **241**
Ilford Ltd. 32-page data booklet describes Ilford X-ray screens and chemicals for industrial radiography.

**Flash History** **207**
Heiland Photo Products. 36-page booklet gives brief history of flash photography.

**Dry Mounting Cloth** **242**
Seal, Inc. Three sample sheets of Chartex dry mounting cloth. Includes instructions and prices.

**Filmstrip Containers** **243**
FilmKare Products Co. Price sheet and sample of plastic filmstrip container.

**Plastic Piping** **233**
Chemtrol. 16-page handbook describes plastic piping systems, installation and coupling methods. Includes tables showing effects of 280 chemicals on five different plastics used in Chemtrol valves, also pressure data.

**Slide Mount Catalog** **234**
Porter Mfg. & Supply Co. 12-page catalog lists materials for mounting film from 16mm to 5 x 7 in. Sample mount included.

**Maskoid Liquid Friskets** **249**
Andrew Jeri Co., Inc. 6-page folder gives description of seven Maskoid Liquid Friskets for use in airbrush work, retouching and coloring.

**Ilford Sheet Film** **248**
Ilford Inc. 12-page booklet gives speed ratings, description, recommended developers, development time, safelights and summary of uses for Ilford HP3, FP3 and HPS sheet films.

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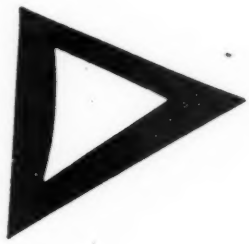

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# NEW PRODUCTS

**For additional information on any new product circle the appropriate number on the readers service card, page 61.**

**Automatic Gas Burst Timer 102**
**A synchronous motor timer with "exclusive differential pressure control that** prevents distributor flooding, a major cause of erratic and ineffective agitation," has been announced by the Rolor Industrial Corp. The timer is furnished with an outlet for an auxiliary solenoid, for extra nitrogen air lines.

**Tray Temperature Control 103**
**An inexpensive 1 x 8-in. temperature control unit for developing trays, the** Thermo-Trol, is said to maintain temperature to within 1°F. once set for a predetermined temperature, according to the manufacturer, Eldorado Products Co., Inc. Price: $16.95.

**Cronar Direct Positive Film 104**
**Cronar DPC film, a high contrast contact-speed, polyester-base film (without** matte finish) which will produce positive from positive and negative from negative reproductions in single exposure and development steps has been announced by Du Pont Photo Products.

Exposures of Cronar film are made through yellow or orange filter sheeting. The new film, it is said, is particularly suitable for making duplicate line and halftone negatives for graphic arts and cartographic uses.

**Fixer in Plastic 120**
**A 5-gal. Poly-Pak for Minit Fix, a rapid fixer for both paper and film, is said to** occupy only 50 per cent of the space of four ordinary gallon bottles. The plastic package design features a liquid concentrate—"add water and Minit Fix is ready for use." Price for 5 gal. Poly-Pak is the same as four 1-gal. bottles.

**Xerographic Printer 101**
**A completely automatic continuous-tone printer was recently completed** by Haloid Xerox for the Air Force. The printer produces finished, xerographic, "permanent" pictures up to 9 in. wide, of any length, on unsensitized paper at the rate of 20 ft. per min. At

this speed, a different 9 x 9-in. picture emerges from the machine every 2¼ secs. The cycle provides the first print in 22 seconds.

The process, which is still considered a prototype rather than a commercial development, is said to resolve 30 lines per mm. Picture contrast can be modified by the turn of a dial, it is said, from "soft" to "very hard."

**Canned Filter Pump 109**
**A portable canned filter pump which is inside a motor housing and magnetically** driven by the motor is said to "eliminate stuffing boxes, rotary seals, shaft wear and alignment problems" according to the manufacturer, Sethco Mfg. Co.


*If the problem calls for 16 frames per second up to 400 frames per second, the new Benson-Lehner 16 mm HS-16B can handle it. No other intermittent camera in the world today combines greater precision and speed. The interchangeable movement combines*

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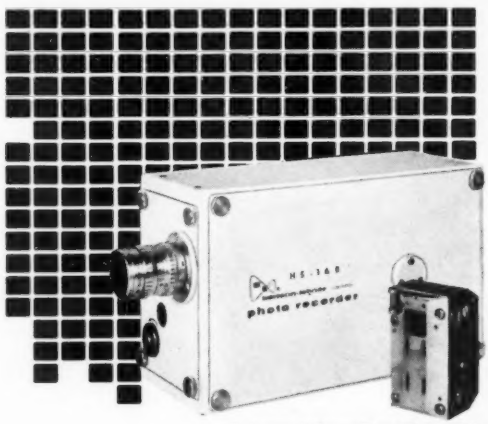



*pin registration with alternate double claw action to give rugged, dependable performance. Film capacity is 200 ft. Any questions? Write the Photo-Instruments Division of Benson/Lehner.*

**benson-lehner** *corporation*
11930 W. Olympic Blvd., Los Angeles, California

A water-jacketed version is available for photography in extremely high temperature environments.

Get more information. Circle 406, page 61

Pump is driven by a ¾ H.P. 110V 60 cycle one phase motor supplied with a thermal starting and overload relay. The all stainless-steel filter chamber which contains one or more filter tubes of multilayered processed cotton or dynel yarn is claimed to provide effective depth filtration of solutions down to 1 micron in size. Porous stone or porous carbon filter tubes are optional. Available in three models SEI-5, SEI-10 and SEI-20 with capacities of 50-75, 100-150 and 200-300 gals. per hour.

### Stack Roll Files 113

**A basic unit made of steel containing four pasteboard tubes for rolled film** or print storage has an add-on feature which permits stacking from floor to ceiling, the Plan Hold Corp. has announced. The tubes are 2¾ in. in diameter and are available in lengths from 24 to 60 in. at 6-in. intervals. Four such tubes are housed in each steel unit, which includes a drop door with snap closure. Finishing tops and bases of steel are available. Price: $5.95 for one unit in the 24-in. length.

### Film Squeegee-It 111

**A wall-mounted film squeegee (for films up to 5 x 7 in.) consisting of two parallel** arms which hold rubber blades is announced by Tomorrow, Inc. The

manufacturer claims that water streaks and spots are eliminated and "that its use can cut squeegee time and labor in half." Price: $8.95.

### Rolor Replenishment System 125

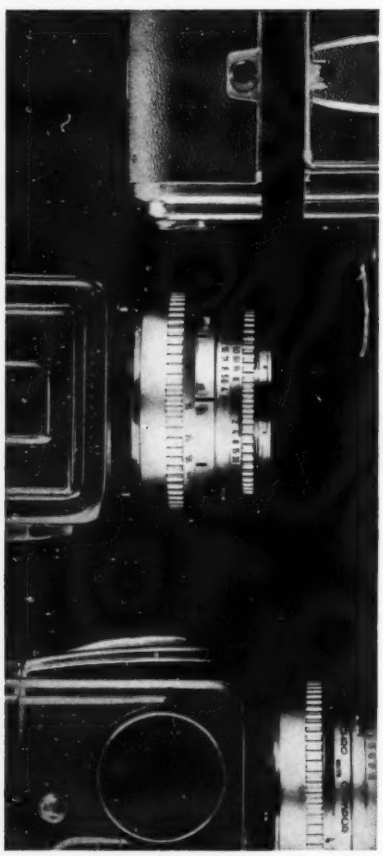
**The Rolor Automatic Replenishment System delivers selected amounts of** replenisher to any specific chemical tank by a touch of a button on the master control panel. The system, manufactured by Rolor Industrial Corp., consists of two basic units, the master control unit and a rack that houses components of the control unit and storage modules containing the replenishment solutions. The storage unit may be 100 ft. away from the processing unit. The master unit houses all necessary panel-mounted controls and low-level indicators for the individual replenishment storage modules. The safety low-level control allows a check on each storage unit, both visually and audibly, by an illuminated indicator and an alarm signal. On Rolor Color processors, the replenishment system may be installed as original factory equipment.

### Photo-Recording Papers

**Two new photo-recording papers have been announced by Eastman Kodak Co.** Kodak Linagraph 77 paper has a relative tungsten speed of 100 and an orthochromatic emulsion that is said to record sharp black traces at writing speeds to 50,000 in. per sec. A wide exposure latitude permits medium-speed photorecording.

Kodak Linagraph 44 has a relative tungsten speed of 20. It is designed to produce high trace density and contrast from low to relatively high writing speeds. CEC Datarite processing can be used for this paper.

Emulsions are coated on a specially treated paper base (average thickness .003 in.) said to give maximum strength, durability and trace reproducibility. The papers are suitable for conventional or stabilization processing and are available in all widths and maximum lengths to fit every oscillograph.

*Interchangeable lenses, film backs and viewers mean you can set this single-lens reflex up for every possible assignment in 7 seconds. Switch from color to black and white in mid-roll . . . change lenses at will . . . add magnifying hood or sports viewer as needed.*

**15 Cameras** ***in one!***

*New model 500C features Synchro-Compur shutter, automatic diaphragm, and coupled EVS system. With Zeiss Planar F:2.8 lens, from $489.50. Write for literature and name of your nearest dealer. PAILLARD Incorporated, 100 Sixth Avenue, New York 13, N. Y.*

**HASSELBLAD**

Get more information. Circle 456, page 61

**Styron Photo Trays** **121**
**Made of laminated "high-impact styron," Richard Manufacturing Co.'s** photo trays are said to give a non-porous surface on the inside of the trays, "providing maximum acid and stain resistance." Available in print sizes from 8 x 10 to 20 x 24 in. plus a 14 x 17 x 6-in. deep hypo or general purpose tray. All trays are larger than print size to allow for finger room, it is said. Prices range from $2.35 to $15.50.

**Cobweb Spinner** **122**
**Now you can have a room full of cobwebs. First in a new line of special effects** equipment is the Cobweb Spinner Moleffect manufactured by the Mole-Richardson Co. It is said to feature simplicity of operation. A thin stream of fluid cobwebs is blown out 5 to 10 ft. for placement as desired. An especially designed carrying case is available to carry the spinner and its accessories.

**2-Side Tape Dispenser** **123**
**A dispenser for double-coated pressure-sensitive tape is said to eliminate slow,** sloppy glue-pots as a means of attaching one paper to another, according to the manufacturer Minnesota Mining and Mfg. Co. Called the C-12 Applier No. 665 a strip of tape 8 in. in length is exposed across the top of the device. The operator lays the paper on top of the tape, pulls to the right until the left edge of the paper is flush with the cutter bar and pulls down to cut the tape. The taped paper is then pressed to whatever it is to be attached.

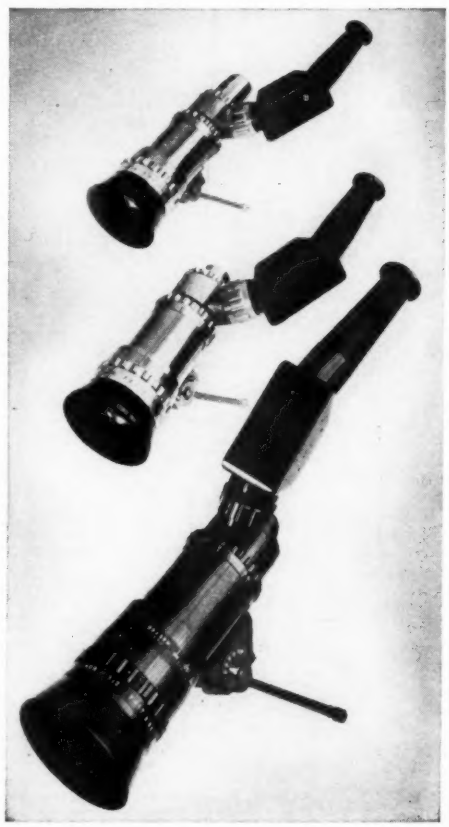
**E-3 Ektachrome Control Strips**
**Exposed unprocessed strips of E-3 Ektachrome 5½ in. long and 35mm** wide, accompanied by a single, master check strip processed in Rochester are available from the Eastman Kodak Co.

The strips may be used only with the E-3 process and are punched so that they will fit into a special wire frame which can be inserted in a Kodak Film and Plate Developing Hanger No. 4A. The strips are packed five to a foil envelope and four envelopes to a package. Kit must be stored in a deep freeze.

**Package Refrigeration** **108**
**A "package" refrigeration unit converts most any hot water supply. The Leedal,** Inc. unit features a water cooled compressor and comes enclosed in a stainless steel cabinet 18 in. high. The manufacturer claims that it will hold water temperature to plus or minus ½°F. Three models are available which furnish 46 to 128 gals. per hour based on 85° inlet water cooled down to 69°F. Prices range from $410 to $1,091.

**Cronaflex Drafting Film** **116**
**A drafting film utilizing .004-in. polyester film base claimed to have one-third** the tensile strength of steel has been announced by Du Pont Photo Products and is available with either one or two sides matte-finished for acceptance of pencil and ink. Title-block printing, with fast-drying inks, may be used on either matte or non-matte sides.

**Multidata 35mm Camera** **127**
**The Model IV-E 35mm Multidata camera simultaneously puts both picture** and data on 35mm film. This is accomplished through the use of split optics which incorporate a front surface mirror, a short focal length lens and a specially designed prism. The optical path passes behind the shutter so that the data recording exposure is independent of target exposure. The readings of the instruments in the data chamber are recorded along one side of the film on the same frame and at the same time as the target data. A clock, four-digit counter and a data slate permit recording of the frame number, time and other data simultaneously. The camera, developed by Flight Research, Inc., can be used as a motion picture camera at speeds to 10 fps or as a single-frame camera.

SOM BERTHIOT

*Made by Som Berthiot, the new Pan Cinor 85 zoom lens features a 5 to 1 ratio, with a focal length range from 17mm wide angle to 85mm telephoto. Speed of f/2.0 is world's fastest. Stops down to f/16. Split-image range finder permits focusing while viewing. Reflex viewing eliminates parallax. Smooth lever action permits jar-free zooming. Color rendition and detail caught by this lens are excellent. $420.00.*

# New f/2.0 Zoom Lens—*17mm-85mm*

*Other zoom lenses include the Pan Cinor 70, for the effects of a multiple lens system from 17.5mm to 70mm. Apertures are from f/2.4 to f/22. Reflex viewing for surer, parallax-free framing. $269.50. For more powerful telephoto effects, the Pan Cinor 100 zooms from 25mm to 100mm and offers reflex viewing and apertures from f/3.4 to f/22, at only $329.50. All Pan Cinor lenses for use with 16mm cameras have standard C Mount. Write today for literature and name of your nearest dealer. PAILLARD Incorporated, 100 Sixth Ave., N. Y. 13, N. Y.*

All prices include F.E.T. where applicable.

BOLEX

Get more information. Circle 457, page 61

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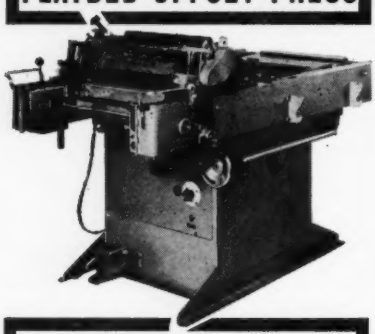

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# PHOTO METHODS IN USE

## PIX NIX NG IRON MAKER

The question: How can you find out what the lining of a blast furnace looks like without sending down a man.

The answer: Send a camera.

This was the problem facing photographers Frank Sluder and Dave Rosecover at the Pueblo Plant of the Colorado Fuel and Iron Corp. when two blast furnaces were in need of relining.

In order to minimize the production loss, the Blast Superintendent decided to close down the one that was most in need of repair, reline it and put it back into operation, after which the second, less damaged furnace could be shut down for its overhaul. Only which furnace had the better lining? Gas prevented a man from going down but if there were some way to photograph the inside wall, that would do the trick.

A 4 x 5 Baco view was decided upon, with a standard camera-mounted flash set-up. Since focus was by guess and maximum depth of field was needed, the fastest available film, Royal-X, was used. The whole rig was cased in a cardboard box to protect the camera from dust, then placed in a wood box and lowered down the top of the furnace. Pictures were made at depths of from 8 to 40 feet.

The first shots were blank. The solenoid failed to sync properly, possibly because of the voltage drop along the 40-ft. extension cord. A second try, this time with a lens in a synchronized shutter and using eight batteries instead of three, was successful.

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## PRINTED CIRCUITS

(*continued from page 47*)

ing in this area should test every paint to determine for himself the one he finds best and easiest to use.

I have found screen print technique offers the advantages of ease and speed compared to photoengraving. For example, once the copper is thoroughly cleaned the screen imprint can be applied very rapidly and the screen resist paint dries rapidly. You eliminate coating, exposure, developing and other steps. Once the acid resist paint is laid down through the stencil screen dry etching can proceed at once. I realize this is a hotly debated subject, but I'll stick out my neck and say that in production work screen printed boards are the most inexpensive approach to quality.

I first became interested in photo etched circuits back in 1943. I have seen the field grow until today it is a big business. It is safe to say it will continue to expand and in not too many years I feel that it will be used even in home wiring.

In conclusion, the craft of making printed circuits is a team job. The engineer must present his needs clearly, the artist must prepare the artwork with equal care and the graphic arts man must transfer the drawing to film and metal capably or all is lost. I haven't mentioned component inserting, plating and many, many facets seemingly not at all related to graphic arts—but they too are interdependent on the other efforts.

The wise first move is to get the team together before a piece of tape is unspooled or a bottle of India ink uncapped. Were this done in more cases I feel that printed circuits would be far more widely used today. Scrap boxes could be much smaller and there would be a drastic reduction in the number of abandoned attempts.—THE END

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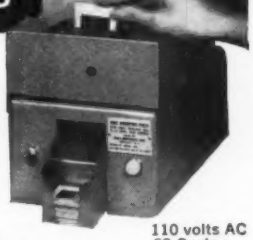
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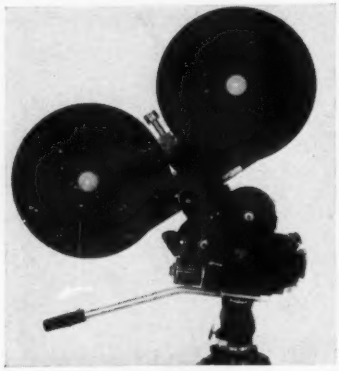

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## INDUSTRIAL COLOR

(*continued from page 53*)

from the condensers. On Omega models changes are made in a negative carrier arm as the color head extends out to the sides of the enlarger. In addition to the standard model, a de luxe model is also available with 14 filters in either Ansco or Kodak series, giving a range from 025 to 157.25 in 025 steps. Price for the standard models is $72. The deluxe Omega model is $108 and the deluxe Beseler model is $102.

### Consistency, where is thy sting

One source of inconsistent results often overlooked is overnight shifts in processing solutions. Replenishment can maintain a certain degree of consistency, but often it is not enough. A method which has proved helpful is to start each morning's processing by removing about 10 per cent of the standing developer and replacing it with fresh stock solution. This is in addition to the normal replenishment rate. Don't overlook proper replenishment of secondary solutions either.

An improperly washed processing basket can be a cause of developer contamination. At times, the Saran screening will retain some of the buffer starting the trouble. A method we use to reduce this contamination is to pour about 8 oz. of used developer into the 3½-gal. tank in which we wash our basket after processing, in an attempt to neutralize the buffer remaining in the basket.

### The print's the thing

We would like to see a paper that has better resolution and cleaner whites, but unfortunately, such a paper is not yet available for professional use. Paper of this type is available for photofinishing as Kodacolor Type 6, but poor keeping qualities of the image and inferior yellows make it unsuitable for our purposes.

While on the subject of prints, one of the greatest needs right now is for a fast, practical way to dry Ektacolor prints. It would be wonderful if it were possible to use a conventional matte print dryer on it, but the emulsion is so soft that prints either stick to the dryer or else show drying marks.

There is no doubt, however, that the Ektacolor process is continually improving as far as reproduction quality is concerned. Kodak has made great strides in making emulsion batches fairly consistent. Steadily, and happily, the batch-to-batch differences have narrowed.—THE END.

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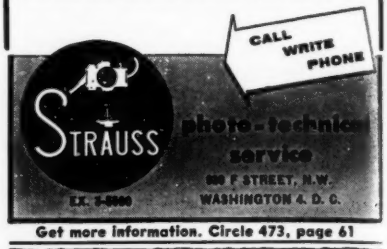


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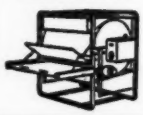

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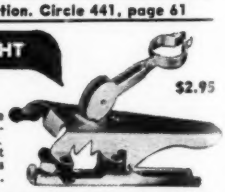

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## P.M. FOR TOMORROW

(*continued from page* 12)

early not to be applicable to silver halide emulsions, except within relatively narrow ranges of light intensities and time periods. A film rated at ASA 200 may produce consistently "perfect" negatives when exposed under a range of illumination conditions that requires no greater variation in exposure times than from, say, 1/500 sec. to 5 sec. (Use of different lens f-numbers is assumed.) But the same film, exposed under an illumination level so low that several minutes exposure time are indicated, might show an effective speed of ASA 100 or less. And a similar loss in speed may be noted if this film is exposed at 1/5000 sec. under appropriately high illumination levels.

The failure of black-and-white films to obey the I x t reciprocity law can, within limits, be compensated for by prolonged development. At the same time, the flattening in contrast that accompanies the loss in film speed also is overcome in most instances. But with color films, the situation is different.

Color films have three or more emulsion layers. Since each emulsion has its own peculiarities, we cannot expect the reciprocity law failure of the different emulsions of a color film to follow the same pattern. Thus, mere increases in exposure to correct for the overall loss in film speed due to reciprocity effects is not a practical solution. The non-uniform rate at which the emulsions lose speed has a marked effect on the color balance of the film, which is rarely correctible by changes in processing.

**QUESTION:** If a sheet of reversal color film, such as Anscochrome or Ektachrome, were exposed first to a yellow light and then to a blue light what color would the processed film have? (Assume that the yellow and blue light exposures are equivalent to each other and that the exposures are normal.)

**ANSWER:** Grey. Blue light in combination with yellow makes white light.

**QUESTION:** Is the diazo process based on light-sensitive dyes?

**ANSWER:** No. This process is based on light-sensitive diazonium compounds which, if *not* exposed, can form dyes by reaction with coupler components, when placed in an alkaline environment. But when exposed, the "diazo" compounds give off nitrogen and lose their ability to combine with a coupler to produce a dye. (All known diazonium salts are much more sensitive to ultraviolet radiation than to light.)

**QUESTION:** A developer is accidentally diluted with twice the normal amount

(*continued on page* 70)


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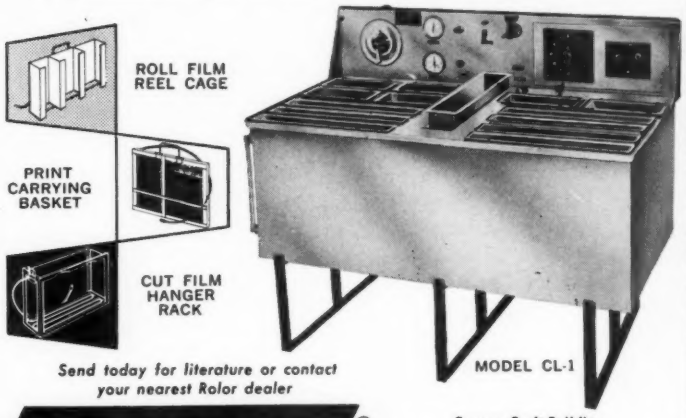


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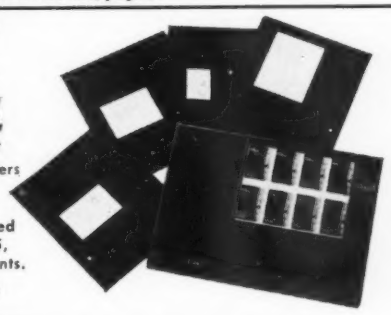

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## P.M. FOR TOMORROW

(*continued from page 69*)

of water. If a film is developed in it for twice the normally recommended time will the results be the same as they would have been under usual conditions? Discuss.

**ANSWER:** Perhaps in some instances, but not as a general rule. A linear relation between time of action and concentration of a developer constituent is seldom found.

**QUESTION:** How many times more "acid" is a solution that has a pH of 4.5 than a solution having a pH of 5.5?

**ANSWER:** Ten times more acid. The pH scale is logarithmic (to the base 10), therefore, a 10X factor applies for each whole number difference in pH value.

**QUESTION:** By using not more than five or six words for each, identify the following names and terms as related to photography: a) C.E.K. Mees (example answer, Retired Director of Kodak Research Labs); b) Cronar (e.g. Du Pont polyester film base); c) Eberhard effect; d) Geneva movement; e) Millimicron; f) Retinal cones; g) Halftone image; h) Half tone; i) Lateral reversal; j) Howard James; k) Niepce; l) Azomethine; m) Aurous thiocyanate; n) C.I.E.; o) Aberration; p) Microphotography; q) Fog; r) Chiaroscuro; s) Granularity; t) Xerography; u) Solarization; v) Sequestering agent; w) Ansco Printon; x) Agfa Printon; y) Vogel; z) Astigmatic.

**ANSWER:** c) Density variations due to area differences. d) Mechanical system for producing intermittent rotation. e) 0.000001mm. f) Eye receptors responsible for color vision. g) Different dot sizes produce apparent gradations. h) A tone visually intermediate of black-and-white. i) Right and left reversal of image. j) Kodak researcher. Specialist in developer theory. k) Inventor of protography. l) Dye class important in color photography. m) Break-through sensitizer for first high speed films. n) Commission Internationale d'Eclairage (International Commission of Illumination. o) A fault, e.g., a lens defect. p) Photographic reproductions at high reduction scale. q) A density not contributing to image. r) Light and shade transitions, tone to tone. s) Objective measure of grain size. t) Electrostatic method of image reproduction. u) Reversal of image tones by overexposure. v) Chemical preventing hard water cations from precipitating. w) A reversal color print material. x) a high contrast black-and-white graphic arts film. y) Discovered dye sensitizing of photographic emulsions. z) Optical system exhibiting, or correcting, astigmatism.—THE END

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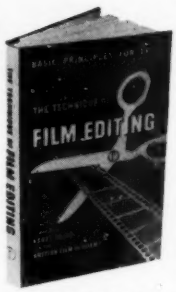


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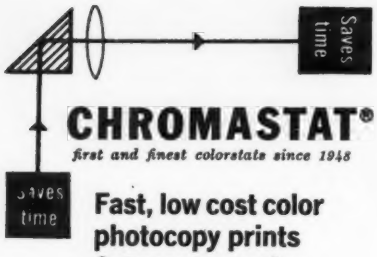


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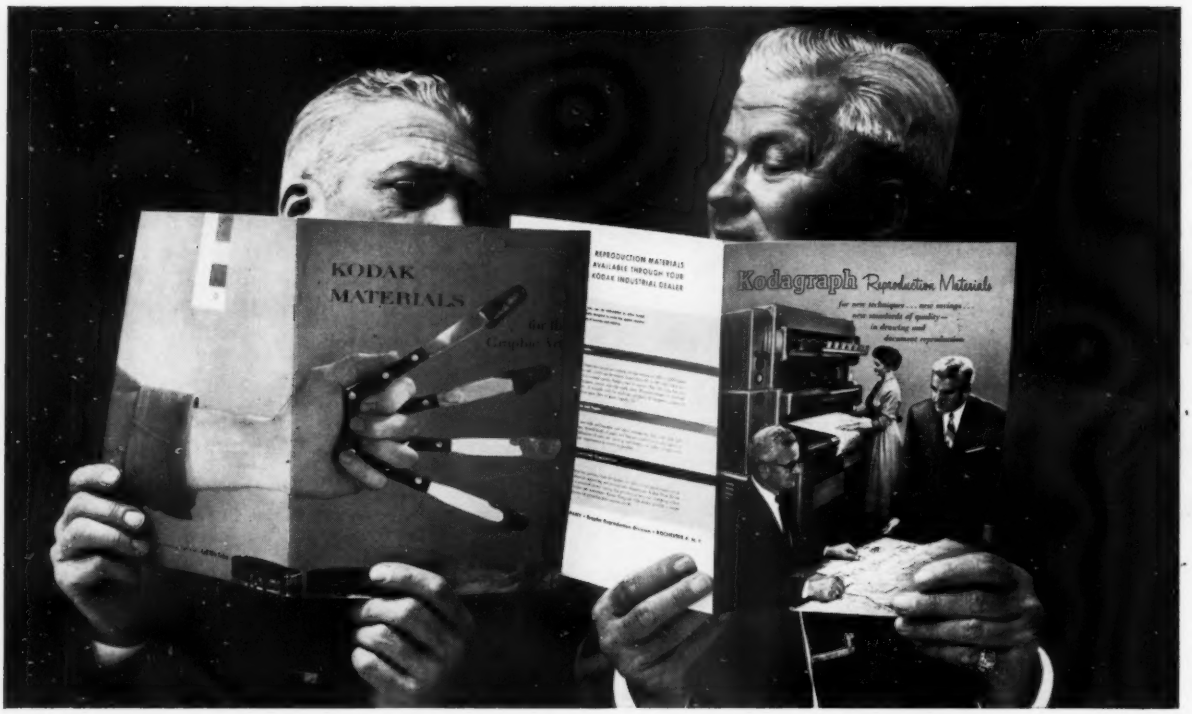


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